visual engineering
LIGHTWARE

# MX32x32HDMI-Pro
# MX16x16HDMI-Pro
# MX8x8HDMI-Pro
# MX32x32DVI-HDCP-Pro
# MX16x16DVI-HDCP-Pro
# MX8x8DVI-HDCP-Pro

## User's Manual

# SAFETY INSTRUCTIONS

Class I apparatus construction. This equipment must be used with a main power system with a protective earth connection. The third (earth) pin is a safety feature, do not bypass, or disable it.

This equipment should be operated only from the power source indicated on the product.

To disconnect the equipment safely from power, remove the power cord from the rear of the equipment, or from the power source. The MAINS plug is used as the disconnect device, the disconnect device shall remain readily operable.

There are no user-serviceable parts inside of the unit. Removal of the top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

The apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.

The apparatus must be safely connected to multimedia systems. Follow instructions described in this manual.

### Replacing the AC fuse

Unplug the AC power cord from the equipment

Locate the AC fuse on the rear of the unit

Replace only the AC fuse as indicated on the rear panel of the unit:

Connect the power cord to the switcher and to the AC power source. Make sure the switcher is working properly.

## WEEE (Waste Electrical & Electronic Equipment)

### Correct Disposal of This Product

This marking shown on the product or its literature, indicates that it should not be disposed with other household wastes at the end of its working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.

Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract. This product should not be mixed with other commercial wastes for disposal.

CE

# DECLARATION OF CONFORMITY

We,

**Lightware Kft. 1071 Budapest Peterdy str. 15 HUNGARY**

as manufacturer declares, that the products

**MX32x32HDMI-Pro**
**MX16x16HDMI-Pro**
**MX8x8HDMI-Pro**
**MX32x32DVI-HDCP-Pro**
**MX16x16DVI-HDCP-Pro**
**MX8x8DVI-HDCP-Pro**

( Video Matrix Switcher )

in accordance with the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EEC are in conformity with the following standards:

**EMI/EMC ..... EN 55103-1 E3, EN 55103-2**
**Safety ..... EN 60065 Class I**

**Date:** 01 September 2007

**Name:** Gergely Vida ( Managing Director )

**Signed:** Vida A. Gergely

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# 1. Box contents

**Routing switcher**
**Rack mounting ears**
**User's manual**
**IEC power cable**
**CD-ROM with control software**
**RS-232 9-pole D-sub Male to Female cable**
**UTP cross-link cable**

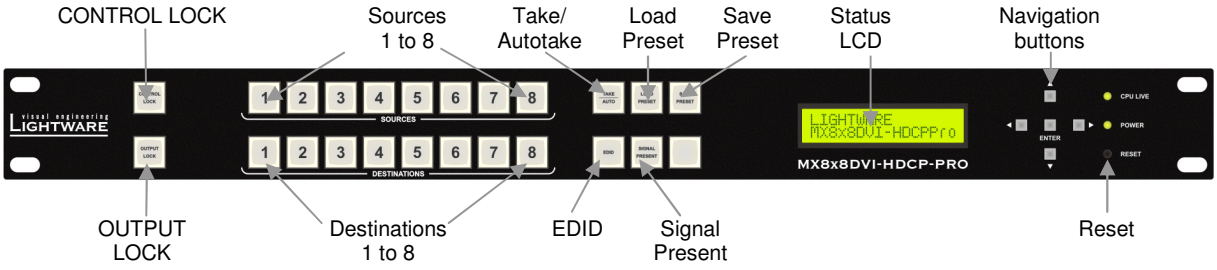
# 2. Modular router concept

MX8x8HDMI-Pro and MX8x8DVI-HDCP-Pro are fixed I/O size matrix switchers with eight inputs and eight outputs respectively.

MX32x32 series and MX16x16 series Pro routers are modular matrix switchers that allow building custom I/O sizes that meet the user's requirements. Different types of input and output cards give the maximum flexibility for rental and installation signal transmission.

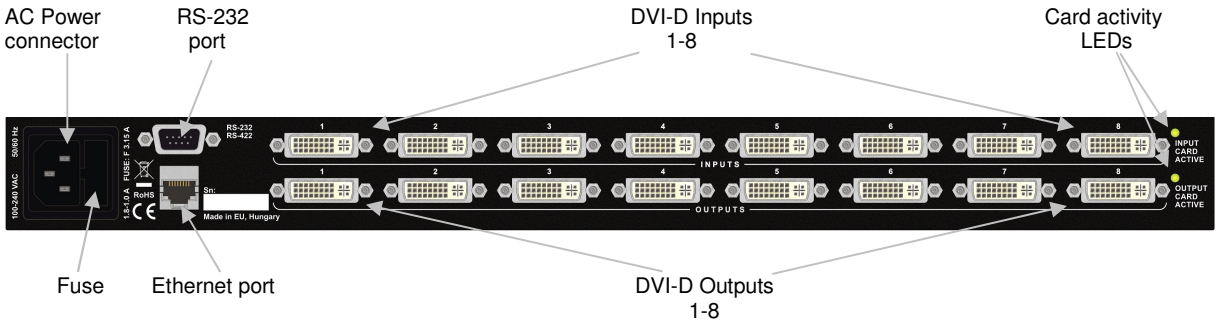
## 2.1. MX8x8 series

### 2.1.1. Front Panel view (all MX8x8 series)

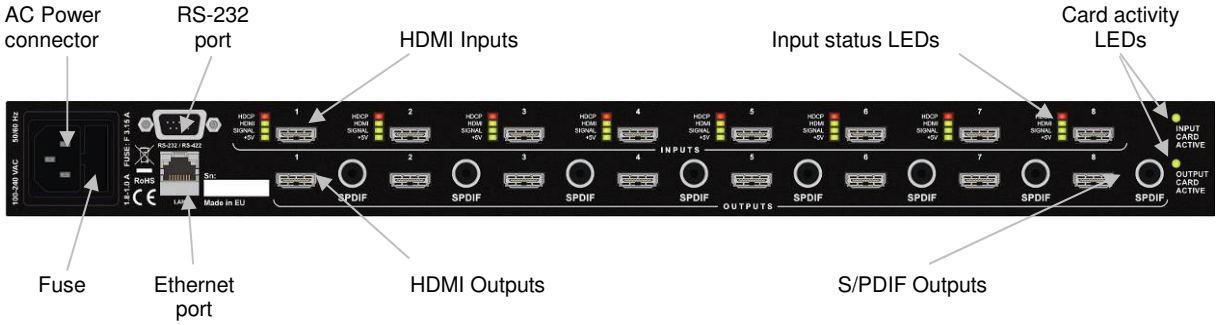



| | |
|---|---|
| **Control Lock** | Disables or enables front panel operation. When it illuminates red, operations on front panel are prohibited. |
| **Output Lock** | Locks and protects one (or more) outputs. It inhibits accidental input changing on protected outputs. |
| **Sources** | Source buttons have three functions: to select an input, to select a preset number and to view the selected input's state (take mode). |
| **Destinations** | Destination buttons have two functions: to select an output, or to view the selected output's state. |
| **Take/Autotake** | This button has two functions: displays the actual switching mode of the router (TAKE mode or AUTOTAKE mode) or executes switching in TAKE mode. |
| **Load Preset** | Loads and executes a previously saved preset from one of the preset memories. |
| **Save Preset** | Stores actual matrix state in one of preset memories. |
| **EDID** | Switches the LCD to EDID menu allowing EDID switch, EDID save etc. |
| **Signal Present** | Displays live sources and attached sinks on source and destination buttons. |
| **Status LCD** | 2x16-character LCD display for menu operations. |
| **Navigation buttons** | (UP, DOWN, LEFT, RIGHT, ENTER) buttons for menu navigation. |
| **Reset** | Hardware reset button. It resets the whole router, however saved settings, presets and EDIDs will be preserved. |
| **Power LED** | Green LED indicating that the unit is powered on. |
| **CPU LIVE LED** | Green blinking LED indicating normal operation. |

### 2.1.2. Rear view (MX8x8DVI-HDCP-Pro)




### 2.1.3. Rear view (MX8x8HDMI-HDCP-Pro)



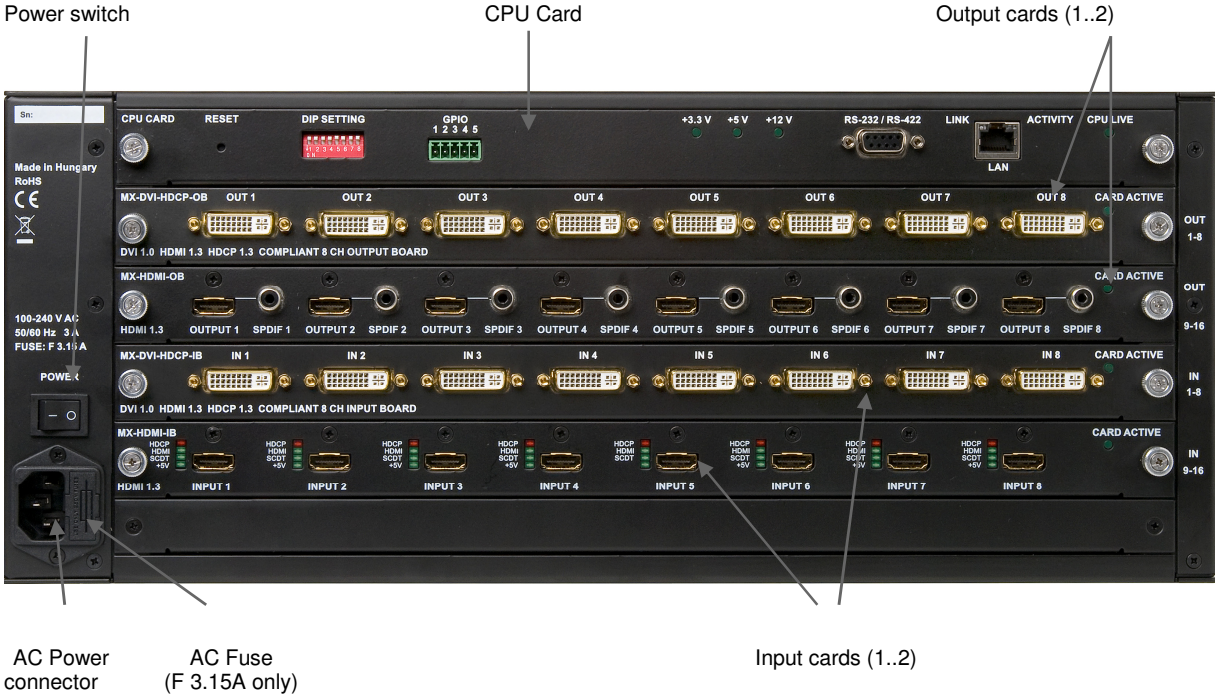

| | |
|---|---|
| **AC Power** | Standard IEC power connector. The router works with 100 to 240 Volts, 50 or 60 Hz power sources. |
| **AC Fuse** | Replace with F 3.15A type only. |
| **RS-232/422 connector** | 9-pole D-sub female connector. Can be ordered with RS-232 or RS-422 control. |
| **Ethernet port** | Standard RJ45 connector. This port can be connected to Local Area Network. |
| **DVI-D inputs** | Standard 29-pole DVI connectors for input connections. It accepts only digital signals. |
| **DVI-D outputs** | Standard 29-pole DVI connectors for outputs. |
| **HDMI inputs** | 19-pole type A HDMI connectors for input connections. |
| **HDMI outputs** | 19-pole type A HDMI connectors for output connections. |
| **S/PDIF outputs** | RCA jack connector with S/PDIF digital audio signal. Embedded audio is still present on HDMI outputs. |
| **Input status LEDs** | Four LEDs help the signal monitoring on each HDMI input port. They indicate the presence of power +5V, the presence of an active video signal, HDMI mode and the HDCP encryption status. |
| **Card activity LEDs** | These LEDs are blinking when the cards are active. |

## 2.2. MX-DVI-FR16

The MX-DVI-FR16 modular frame allows building custom matrices with up to 16 inputs and 16 outputs. The card in the uppermost slot must be a CPU card that is responsible for controlling the matrix. The two input and two output slots accept any kind of input and output card which are described in section 2.5 and section 2.6.

The front panel has exactly the same controls as the MX8x8 series but with 16 input and 16 output selector buttons.

### 2.2.1. Rear view of MX-DVI-FR16



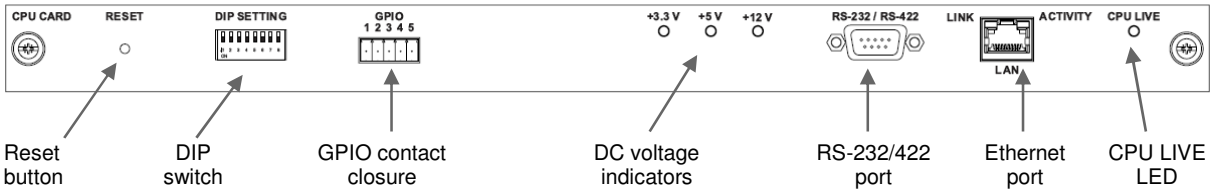

## 2.3. MX-DVI-FR32R

The MX-DVI-FR32 modular frame allows building custom matrices with up to 32 inputs and 32 outputs. The card in the uppermost slot must be a CPU card that is responsible for controlling the matrix. The two input and two output slots accept any kind of input and output card which are described in section 2.5 and section 2.6.

The front panel has exactly the same controls as the MX8x8 series but with 32 input and 32 output selector buttons.

This frame can be ordered with redundant power supply.

## 2.4. CPU-CARD

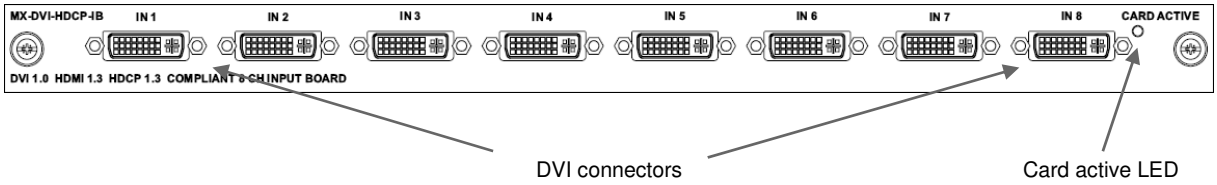



In order for the MX-DVI-FR16(R) and MX-DVI-FR32R frames to work, a CPU-CARD is needed. This card is responsible for controlling the matrix and storing all the settings.

| | |
|---|---|
| **Reset button** | Hardware reset button. Press to reset the whole frame. Crosspoints and presets will not be reset. |
| **DIP Switch** | 8-circuit DIP switch – not used in current version. |
| **GPIO Contact closure** | Relay output for alarm signaling. |
| **DC voltage indicators** | LED indicators for internal DC power voltages. All LEDs must light continuously during normal operation. |
| **RS 232/422 connector** | 9-pole D-sub female connector. Can be ordered with RS-232 or RS-422 control. |
| **Ethernet port** | RJ45 connector. Remote control port for connecting the unit to Local Area Network. |
| **CPU LIVE LED** | Green blinking LED indicating normal operation. |

## 2.5. Input Cards

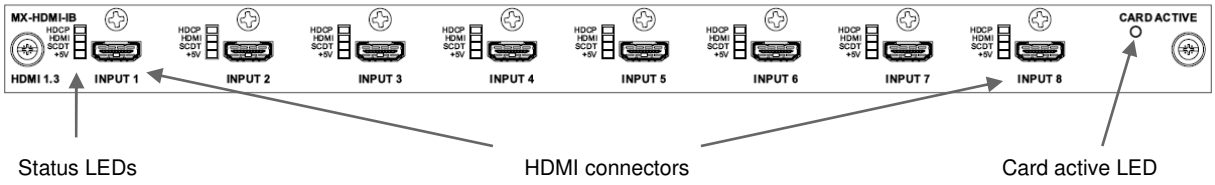
### 2.5.1. MX-DVI-HDCP-IB




This 8-channel DVI-D (digital only) input card supports single link DVI signals up to 165MHz pixel clock and HDMI 1.3 signals including deep color modes and audio signals. The built-in cable equalization enables the use of long cables as specified on page 25.

| | |
|---|---|
| **Connectors** | 8 DVI-I (only digital pins are connected) |
| **Cable equalization** | Automatic or manual, up to 40dB |
| **Signal reclocking** | Yes |
| **DVI support** | Up to 165MHz pixel clock, single link only |
| **HDMI support** | HDMI 1.3 compliant<br>Up to 225MHz pixel clock<br>16, 24, 30 and 36 bits/pixel are supported<br>RGB, YUV 4:4:4 and YUV 4:2:2 modes |
| **Audio** | PCM (up to 192 kHz and 8 channels), Dolby, DTS, MLP, Dolby True-HD and DTS-HD Master Audio support |
| **HDCP** | HDCP 1.3 compliant |
| **Signal monitoring** | PWR5V, SCDT<br>HDMI/DVI mode discrimination<br>HDCP encryption status<br>Resolution, Vsync and Hsync frequencies<br>Color space<br>Audio information (type, sampling frequency, channels)<br>Timing parameters (front porch, back porch, pixel repetition, TMDS and pixel clock frequency and so on) |
| **Processing** | Color range compression or expansion |
| **EDID emulation** | 256-byte E-EDID |

### 2.5.2. MX-HDMI-IB



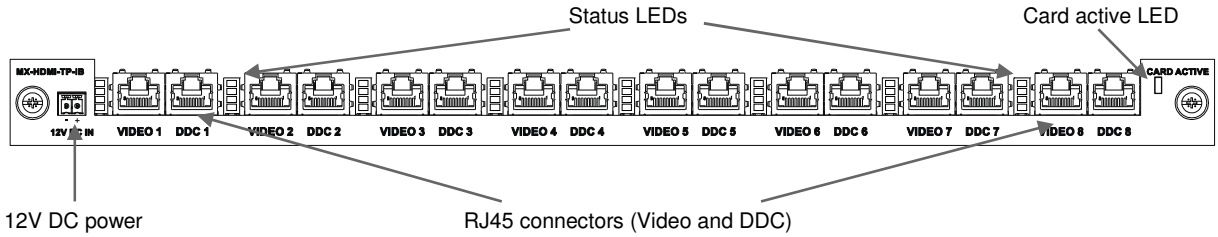

This 8-channel HDMI input card has exactly the same capabilities as the **MX-DVI-HDCP-IB** described above in section 2.5.1. It is built with 19-pole type A HDMI connectors and each input has four status LEDs to help the installation and debugging process. These LEDs indicate the following (from bottom to top):

| | |
|---|---|
| **+5V** | Source is connected and powered. The PWR5V pin is driven by source with an active high signal. |
| **SCDT** | Valid video signal is detected and sync can be extracted. |
| **HDMI** | If this LED illuminates, the incoming signal is HDMI. If it does not illuminate then the incoming signal is DVI. |
| **HDCP** | It illuminates red when the incoming signal is content protected and HDCP encrypted. |

*Info:* *During the booting process the state of these LEDs is undetermined.*

| | |
|---|---|
| **Connectors** | 8 HDMI Type A connectors |
| **Cable equalization** | Automatic or manual, up to 40dB |
| **Signal reclocking** | Yes |
| **DVI support** | Up to 165MHz pixel clock, single link only |
| **HDMI support** | HDMI 1.3 compliant<br>Up to 225MHz pixel clock<br>16, 24, 30 and 36 bits/pixel are supported<br>RGB, YUV 4:4:4 and YUV 4:2:2 modes |
| **Audio** | PCM (up to 192 kHz and 8 channels), Dolby, DTS, MLP, Dolby True-HD and DTS-HD Master Audio support |
| **HDCP** | HDCP 1.3 compliant |
| **Signal monitoring** | PWR5V, SCDT<br>HDMI/DVI mode discrimination<br>HDCP encryption status<br>Resolution, Vsync and Hsync frequencies<br>Color space<br>Audio information (type, sampling frequency, channels)<br>Timing parameters (front porch, back porch, pixel repetition, TMDS and pixel clock frequency and so on) |
| **Processing** | Color range compression or expansion |
| **EDID emulation** | 256-byte E-EDID |

### 2.5.3. MX-HDMI-TP-IB




This 8-channel HDMI input card is equipped with two RJ45 connectors per each input. The card has exactly the same capabilities as the **MX-DVI-HDCP-IB** described above in section 2.5.1. There are three status LEDs next to every input, which indicate the following (from bottom to top):

| | |
|---|---|
| **SCDT** | Valid video signal is detected and sync can be extracted. |
| **HDMI** | If this LED illuminates, the incoming signal is HDMI. If it does not illuminate then the incoming signal is DVI. |
| **HDCP** | It illuminates red when the incoming signal is content protected and HDCP encrypted. |

During the booting process the state of these LEDs is undetermined.

| | |
|---|---|
| **Connectors** | 8 HDMI Type A connectors |
| **Signal reclocking** | Yes |
| **DVI support** | Up to 165MHz pixel clock, single link only |
| **HDMI support** | HDMI 1.3 compliant<br>Up to 225MHz pixel clock<br>16, 24, 30 and 36 bits/pixel are supported<br>RGB, YUV 4:4:4 and YUV 4:2:2 modes |
| **Audio** | PCM (up to 192 kHz and 8 channels), Dolby, DTS, MLP, Dolby True-HD and DTS-HD Master Audio support |
| **HDCP** | HDCP 1.3 compliant |
| **Signal monitoring** | The same as described above in section 2.5.1 |
| **Processing** | Color range compression or expansion |
| **EDID emulation** | 256-byte E-EDID |

The pin assignment for the RJ45 connectors can be found on page 23. The maximum cable lengths are specified on page 25.

This card is compatible with the following Lightware products:

**DVI-HDCP-TP-TX100**

**HDMI-HDCP-TP-TX100**

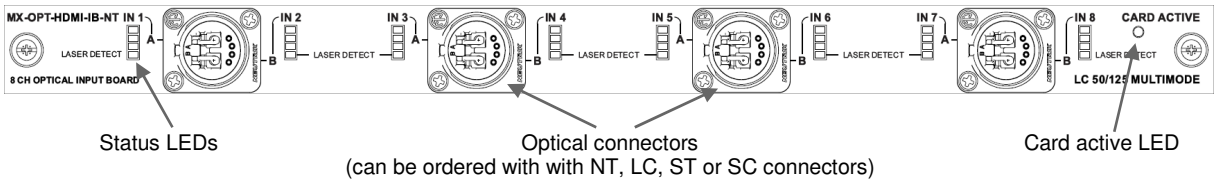
**MX-HDMI-TP-OB** (see 2.6.3.)

**DVI-TP-TX200** (DVI signals only, HDCP is not supported)

**MX-DVI-TP-OB card** (DVI signals only, HDCP is not supported)

For further details on these devices, please visit the http://www.lightware.eu webpage.

### 2.5.4. MX-OPT-HDMI-IB




This 8-channel optical input card is fully compatible with the HDMI 1.3 and HDCP 1.3 standard. This card uses Lightware's Single Fiber Technology, which eliminates the need for additional copper cables. Only one multimode fiber cable is used per one DVI signal. Single fiber technology lowers the system infrastructure cost and isolates sources and receivers from ground loops and hum noises.

Main features:

| | |
|---|---|
| **Connectors** | 8x LC or 8x SC or 8x ST or 8x Neutrik NO2-4FD type |
| **Max. cable length** | 2600 meters at 1080p |
| **Cable type** | 50/125 multimode fiber |
| **HDMI** | HDMI 1.3 compliant<br>Up to 225MHz pixel clock<br>16, 24, 30 and 36 bits/pixel are supported<br>RGB, YUV 4:4:4 and YUV 4:2:2 modes |
| **Audio** | PCM (up to 192kHz and 8 channel), Dolby, DTS, MLP, Dolby True-HD and DTS-HD Master Audio support |
| **HDCP** | HDCP 1.3 compliant |

There are four status LEDs next to every input, which indicate the following (from bottom to top):

| | |
|---|---|
| **LASER detect** | It illuminates green when laser beam is detected. |
| **SCDT** | It illuminates green when pixel clock is detected. |
| **HDMI** | If this LED illuminates, the incoming signal is HDMI. If it does not illuminate then the incoming signal is DVI. |
| **HDCP** | It illuminates red when the incoming signal is content protected and HDCP encrypted. |

This card is compatible with the following Lightware products:

**HDMI-OPT-TX300**

**MX-HDMI-OPT-OB** (see 2.6.4.)

**DVI-OPT-TX100** (DVI signals only, HDCP is not supported)

**DVI-OPT-TX200** (DVI signals only, HDCP is not supported)

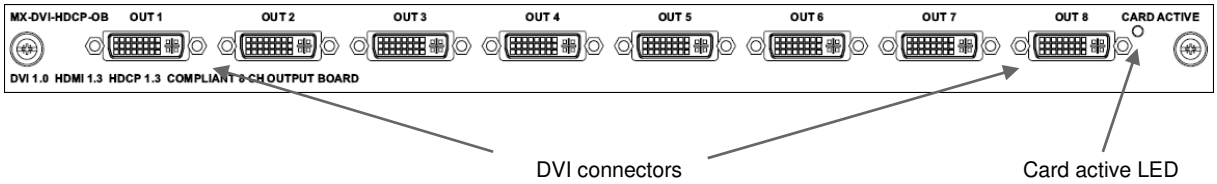
**MX-DVI-OPT-OB-NT card** (DVI signals only, HDCP is not supported)

**MX-DVI-OPT-OB-R-LC card** (DVI signals only, HDCP is not supported)

For further details on these devices, please visit the http://www.lightware.eu webpage.

## 2.6. Output Cards

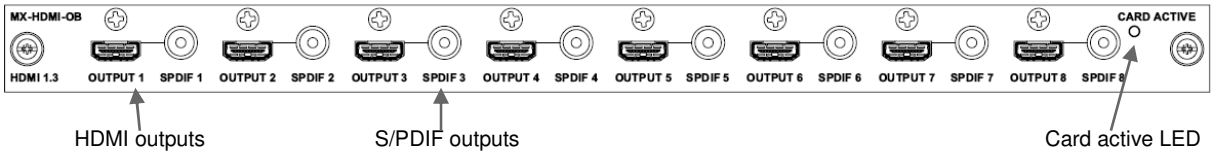
### 2.6.1. MX-DVI-HDCP-OB




8-channel DVI-D (digital only) output card. It is compatible with HDMI1.3 and HDCP standards and allows making specific conversions independently on each output port. These conversions can be done automatically based on the EDID of the display or can be manipulated manually.

| | |
|---|---|
| **Connectors** | 8 DVI-I (only digital pins are connected) |
| **Signal reclocking** | Yes |
| **DVI support** | Up to 165MHz pixel clock, single link only |
| **HDMI support** | Up to 225MHz pixel clock, HDMI 1.3 compatible |
| **Audio** | PCM (up to 192 kHz and 8 channels), Dolby, DTS, MLP, Dolby True-HD and DTS-HD Master Audio support |
| **HDCP** | HDCP 1.3 compliant |
| **Signal monitoring** | Same as described at **MX-DVI-HDCP-IB**. |
| **Processing** | HDMI-to-DVI, DVI-to-HDMI,<br>conversions between 24/30/36 bpp modes,<br>any-to-any color space converter,<br>color range compression or expansion,<br>downsampling 2ch PCM audio by 2x or 4x. |

### 2.6.2. MX-HDMI-OB

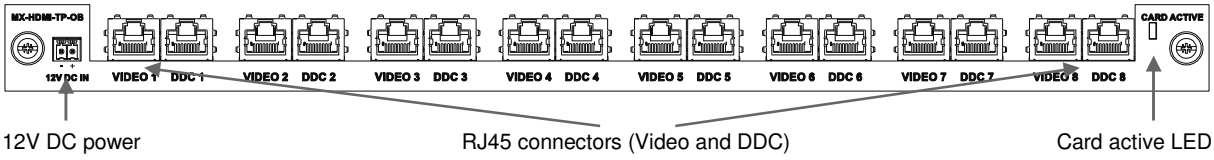



8-channel HDMI 1.3 compatible output card. Each output port has an RCA connector on which S/PDIF audio is sent, however the audio signal can be transmitted on the HDMI ports at the same time.

| | |
|---|---|
| **Connectors** | 8x 19-pole type A HDMI connectors<br>8x RCA connectors |
| **Signal reclocking** | Yes |
| **DVI support** | Up to 165MHz pixel clock, single link only |
| **HDMI support** | Up to 225MHz pixel clock, HDMI 1.3 compatible |
| **HDCP** | HDCP 1.3 compliant |
| **Signal monitoring** | Same as described at **MX-DVI-HDCP-IB**. |
| **Conversions** | Same as described at **MX-DVI-HDCP-OB**. |

*Info:* *The Dolby True-HD and DTS-HD Master Audio formats cannot be outputted on the RCA connectors due to their bandwidth needs, which exceed the maximum of the S/PDIF standard.*

### 2.6.3. MX-HDMI-TP-OB




This 8-channel HDMI 1.3 compatible output card is equipped with two RJ45 connectors per each port.

| | |
|---|---|
| **Connectors** | 8x 2 RJ45 connectors |
| **Signal reclocking** | Yes |
| **DVI support** | Up to 165MHz pixel clock, single link only |
| **HDMI support** | Up to 225MHz pixel clock, HDMI 1.3 compatible |
| **HDCP** | HDCP 1.3 compliant |
| **Signal monitoring** | Same as described at **MX-DVI-HDCP-IB**. |
| **Conversions** | Same as described at **MX-DVI-HDCP-OB**. |
| **RS-232** | This card can be ordered with an optional RS-232 add-on card. Each port has an RS-232 connection, where the RX and TX lines are connected to the RJ45 connectors. |
| **S/PDIF** | It is possible to transmit the audio signal from the S/PDIF connector instead of the RS-232 signal over the cable. It is also possible to transmit the audio signal extracted from the incoming HDMI signal. These settings can be done by setting a jumper on the card. |

This card is compatible with the following Lightware products:

**DVI-HDCP-TP-RX100**

**HDMI-HDCP-TP-RX100**

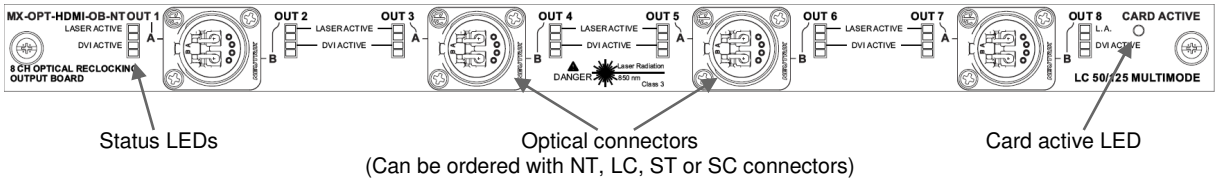
**MX-HDMI-TP-IB** (see 2.5.3)

**DVI-TP-RX100** (DVI signals only, HDCP is not supported)

**MX-DVI-TP-IB card** (DVI signals only, HDCP is not supported)

For further details on these devices, please visit the http://www.lightware.eu webpage.

### 2.6.4. MX-OPT-HDMI-OB




This 8-channel optical output card is fully compatible with the HDMI 1.3 and HDCP 1.3 standards. This card uses Lightware's Single Fiber Technology, which eliminates the need for additional copper cables.

Main features:

| | |
|---|---|
| **Connectors** | 8x LC or 8x SC or 8x ST or 8x Neutrik NO2-4FD type |
| **Cable type** | 50/125 multimode fiber |
| **HDMI** | HDMI 1.3 compliant<br>Up to 225MHz pixel clock<br>16, 24, 30 and 36 bits/pixel are supported<br>RGB, YUV 4:4:4 and YUV 4:2:2 modes<br>PCM (up to 192kHz and 8 channels), Dolby, DTS, MLP, Dolby True-HD and DTS-HD Master Audio support |
| **HDCP** | HDCP 1.3 compliant |

There are four status LEDs next to every input, which indicate the following (from bottom to top):

| | |
|---|---|
| **LED0** | Reserved |
| **HDMI** | It illuminates green when the port operates in HDMI mode |
| **HDCP** | It illuminates green when HDCP encryption is active. |
| **LASER active** | It illuminates red when laser beam is detected. |

This card is compatible with the following Lightware products:

**HDMI-OPT-RX300**

**MX-HDMI-OPT-IB** (see 1.1.1.)

**DVI-OPT-RX100** (DVI signals only, HDCP is not supported)

**DVI-OPT-RX200** (DVI signals only, HDCP is not supported)

**MX-DVI-OPT-IB-NT card** (DVI signals only, HDCP is not supported)

**MX-DVI-OPT-IB-R-LC card** (DVI signals only, HDCP is not supported)

## 2.7. General features

**Advanced EDID Management** – The user can emulate any EDID on the switcher's inputs independently, read out and store any attached monitor's EDID in 100 internal memory locations, upload and download EDID files using Matrix Control Software.

**Non-blocking cross point matrix architecture** – The router allows any input to be switched to any output or more outputs simultaneously.

**2.25 Gb/s channel transmission** – Routes any DVI single link signal between 25 and 225 MHz pixel clock frequency conforming to DVI 1.0 and HDMI1.3 standards.

**Supports all HDTV resolutions** – 720p, 1080i, 1080p 2K etc. HDTV signals up to 225 MHz pixel clock frequency regardless of the actual resolution passed through the router.

**Control by front panel buttons** – 32/16/8 source select, 32/16/8 destination select, Take, Load preset, Save preset, Panel Lock, Output Lock.

**Relegendable buttons** – Each button has an easy removable flat cap and a translucent label that can be inserted under the cap to identify sources and destinations.

**RS-232 or RS-422 control** – Simple ASCII based RS-232 protocol is used for switching, preset calling, status request, etc.

**Ethernet control** – TCP/IP Ethernet 10Base-T or 100Base-TX (Auto-Sensing).

**Built-in WEB site** – Easy access from a WEB browser to control and configure the switcher.

**Universal power supply** – The routers accept AC voltages from 100 to 240 Volts with 50 or 60 Hz line frequency on standard IEC connector.

**Power failure memory** – In case of power failure, the unit stores its latest configuration, and after next power up it loads automatically.

**HDCP compliant** – All DVI-HDCP and HDMI routers comply with HDCP1.2 standard. Lightware is a legal HDCP adopter. The included advanced HDCP management eliminates the need for reauthentication upon switching.

**50 meter input cable compensation** – Using 22AWG high quality DVI or HDMI cable, the inputs are automatically compensated for up to 50-meter cable length at 24bpp, which extends installation possibilities even at the highest HDTV or computer resolutions.

**Input and Output PLL reclocking** – (removes jitter caused by long cables) Each output has a clean, jitter free signal, eliminating signal instability and distortion caused by long cables or connector reflections.

**Signal analysis** – Using the built-in webpage or Matrix Controller software the user can monitor incoming signal parameters such as resolution, signal timing parameters, color space, audio

type, scan rate, HDCP encryption and so on. (on specific cards)

**Color space and color range conversion** – Video signals can be converted between RGB, YUV 4:4:4 and YUV 4:2:2 signals in all directions. Converting between limited and full range is also possible. (on specific output cards)

**Deep Color support and conversion** – It is possible to transmit the highest quality 30-bit or 36-bit video streams for perfect color reproduction. The signal can be converted freely on each output so you can get the best possible quality on every display.

**DVI/HDMI conversion** – The router is able to convert between DVI and HDMI signals so that you can watch HDMI videos on your computer display without audio.

## 2.8. Electrical connections

### 2.8.1. Signal inputs

MX32x32DVI-HDCP-Pro, MX16x16DVI-HDCP-Pro and MX8x8DVI-HDCP-Pro provide 29-pole DVI connectors for input connections, however only digital signal pins are connected. Always use high quality DVI cables to connect sources and displays.

| Pin | Signal | Pin | Signal | Pin | Signal |
|---|---|---|---|---|---|
| **1** | TMDS Data2- | **9** | TMDS Data1- | **17** | TMDS Data0- |
| **2** | TMDS Data2+ | **10** | TMDS Data1+ | **18** | TMDS Data0+ |
| **3** | TMDS Data2 Shield | **11** | TMDS Data1 Shield | **19** | TMDS Data0 Shield |
| **4** | nc | **12** | nc | **20** | nc |
| **5** | nc | **13** | nc | **21** | nc |
| **6** | DDC Clock | **14** | +5V Power | **22** | TMDS Clock Shield |
| **7** | DDC Data | **15** | GND (for +5V) | **23** | TMDS Clock+ |
| **8** | nc | **16** | Hot Plug Detect | **24** | TMDS Clock- |

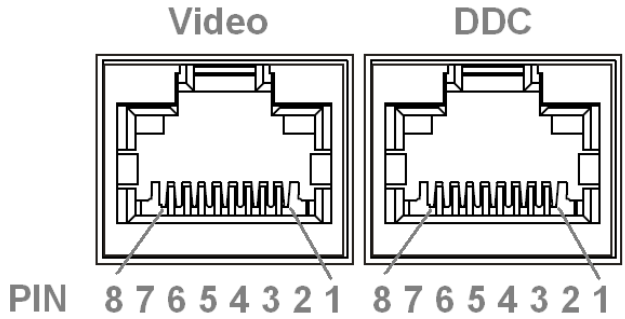
***DVI connector Single Link pin assignment***

MX32x32HDMI-Pro, MX16x16HDMI-Pro, and MX8x8HDMI-Pro provide 19-pole type A HDMI connectors for input connections.

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| **1** | TMDS Data2+ | **2** | GND |
| **3** | TMDS Data2- | **4** | TMDS Data1+ |
| **5** | GND | **6** | TMDS Data1- |
| **7** | TMDS Data0+ | **8** | GND |
| **9** | TMDS Data0+ | **10** | TMDS Clock+ |
| **11** | GND | **12** | TMDS Clock- |
| **13** | nc | **14** | nc |
| **15** | SCL | **16** | SDA |
| **17** | DDC/CEC GND | **18** | +5V Power |
| **19** | Hot Plug Detect | | |

***HDMI connector pin assignment***

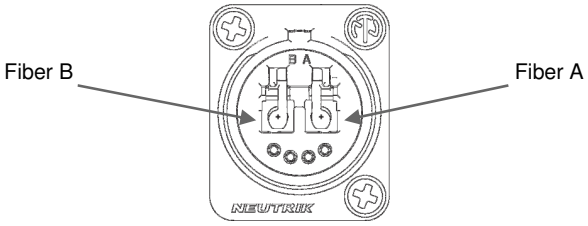
MX-HDMI-TP-IB and MX-HDMI-TP-OB cards use two RJ45 connectors per each input.



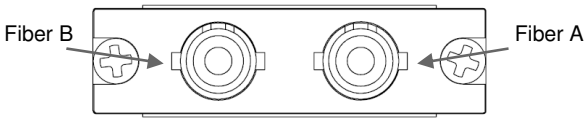

| Video (left connector) | | DDC (right connector) | |
|---|---|---|---|
| **Pin** | **Signal** | **Pin** | **Signal** |
| **1** | TMDS Data0+ | **1** | nc |
| **2** | TMDS Data0- | **2** | Hot Plug Detect (out) |
| **3** | TMDS Clock+ | **3** | RS232 TX (out) |
| **4** | TMDS Data1+ | **4** | RS232 RX |
| **5** | TMDS Data1- | **5** | DDC SCL |
| **6** | TMDS Clock- | **6** | +12V (out) |
| **7** | TMDS Data2+ | **7** | DDC SDA |
| **8** | TMDS Data2- | **8** | GND |

***RJ45 connector PIN assignment***

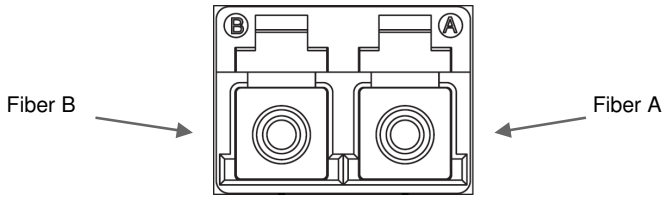
The MX-OPT-HDMI-IB and MX-HDMI-OPT-OB cards can be ordered with either Neutrik NO2-4FD type connector or LC connectors.



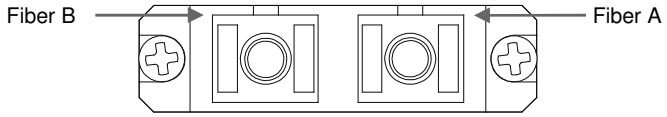

***Neutrik NO2-4FD connector***




***ST connector***



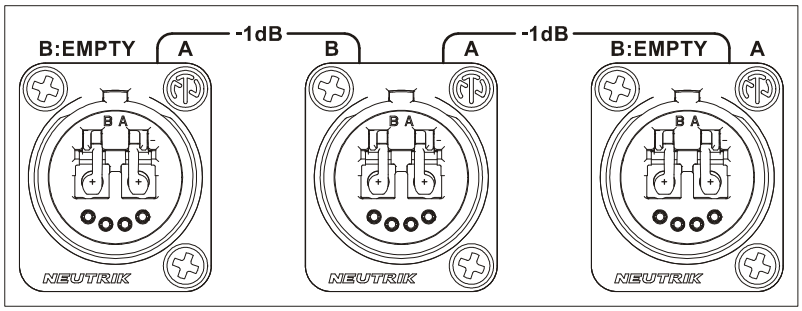

***LC connector***




**SC connector**

### 2.8.2. BR-N Optional Neutrik breakout box

Since Neutrik connectors have two independent fibers in one cable, Lightware offers the BR-NT Optional Neutrik breakout box to separate the individual signals from each other.




***BR-NT Neutrik breakout box***

The breakout box is a passive component and it adds 1 dB attenuation to each fiber.

### 2.8.3. Maximal Cable length at inputs

The unit has an advanced built-in cable compensation circuit, which provides automatic or manual cable length compensation. This circuit extends the maximum usable cable length to even 50 meters using high quality 22AWG copper cable at WUXGA 1920x1200 graphics resolution.

| Cable type / Signal | **22 AWG** Reference type DVI GEAR: SHR DVI | **24 AWG** Reference type TASKER: TSK 1060 |
|---|---|---|
| **Resolutions at 24 bits/pixel** | **Max length (meter)** | **Max length (meter)** |
| **1920x1200; 1600x1200; 2048x1080p; 1920x1080p** | 60 m | 50 m |
| **1680x1050; 1400x1050; 1280x1024** | 75 m | 62 m |
| **1024x768; 1365x768; 1280x720p; 1920x1080i;** | 92 m | 77 m |
| **800x600** | 100 m | 84 m |
| **640x480; 480p; 576p** | 120 m | 100 m |

***Maximum DVI or HDMI cable lengths at inputs***

The maximum cable lengths at the inputs of the MX-HDMI-TP-IB are shown below:

| Resolution | Cat5e UTP | Cat5e FTP | CAT6 UTP | CAT6 FTP | CAT6 SFTP | CAT7 SFTP |
|---|---|---|---|---|---|---|
| **640x480@60** | 60 m | 60 m | 65 m | 70 m | 70 m | 80 m |
| **800x600@60** | 60 m | 60 m | 65 m | 65 m | 65 m | 75 m |
| **1024x768@60** | 55 m | 55 m | 60 m | 60 m | 60 m | 75 m |
| **1280x720p60** | 55 m | 55 m | 60 m | 60 m | 60 m | 70 m |
| **1280x1024@60** | 50 m | 50 m | 55 m | 60 m | 60 m | 65 m |
| **1400x1050@60** | 45 m | 45 m | 45 m | 55 m | 55 m | 60 m |
| **1600x1200@60** | 30 m | 35 m | 35 m | 45 m | 45 m | 50 m |
| **1920x1080p60** | 30 m | 35 m | 35 m | 45 m | 45 m | 50 m |
| **1920x1200p60** | 30 m | 35 m | 35 m | 45 m | 45 m | 50 m |

***Maximum UTP cable lengths at inputs***

The above listed values were measured in 24 bits/pixel mode. The maximal cable length in deep color modes will be shorter due to the higher data rate.

### 2.8.4. Signal outputs

MX-DVI-HDCP-OB cards provide 29-pole DVI connectors for output connections. As with standard DVI outputs, the usable cable length is limited, since there is no output amplification applied. For longer cable runs at the outputs, use fiber optical extenders or active DVI repeaters/extenders.

MX-HDMI-OB cards provide 19-pole type A HDMI connectors for output connections. Additionally to each HDMI output, an RCA jack connector is provided with S/PDIF digital audio signal. Note that embedded audio is still present on HDMI outputs.

**Output reclocking**

Each output signal is reclocked and stabilized. Signal reclocking is an essentially important procedure in digital signal transmission. After passing the reclocker circuit, the signal becomes stable and jitter-free, and can be transmitted over more equipment like processors or event controllers. Without reclocking, sparkles, noise, and jaggies can be seen on the image.

**Fiber Cable powering**

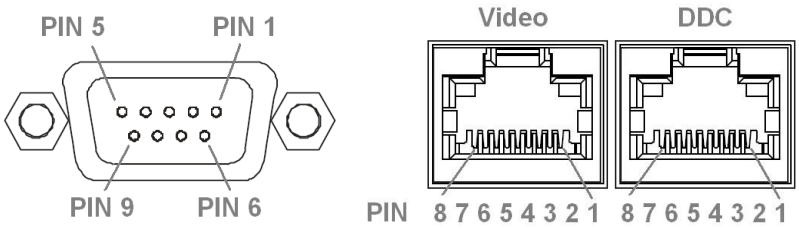
As a special feature, Pro series matrix switchers provide 500 mA current on +5V output (pin 14 on DVI output connectors and pin 18 on HDMI output connectors ) which is sufficient to supply power to fiber optical DVI cables. Standard DVI outputs or VGA cards only supply 55 mA current on +5V output, thus they are unable to directly power a fiber optical cable.

### 2.8.5. Power connection

Plug a standard IEC power cord into this connector to connect the switcher to a 100 to 240 Volt AC, 50 Hz or 60 Hz power source.

### 2.8.6. RS-232/422 and Ethernet control port

Lightware Pro series matrix switchers can be remote controlled through industry standard 9-pole D-sub female connector located on the rear panel of the unit. The router can be ordered with RS-232 or RS-422 control port.




***RS-232 and RJ45 connector pin locations***

| Pin nr. | RS-232 | RS-422 |
|---|---|---|
| **1** | NC non connected | TX- data transmit complement |
| **2** | **TX data transmit** | TX+ data transmit true |
| **3** | **RX data receive** | RX+ data receive true |
| **4** | DTR internally connected to Pin 6 | RX- data receive complement |
| **5** | **GND signal ground (shield)** | GND signal ground (shield) |
| **6** | DSR internally connected to Pin 4 | NC non connected |
| **7** | RTS internally connected to Pin 8 | NC non connected |
| **8** | CTS internally connected to Pin 7 | NC non connected |
| **9** | NC non connected | NC non connected |

***RS-232 and RS-422 pin connections***

For IP based Ethernet control use the RJ45 connector. IP based commands are identical to RS-232 control commands. For more information please read the Programmer's reference*.*

# 3. OPERATION

## 3.1. POWER

Connect the power cord to the router's IEC standard power input connector. The router is immediately powered ON when the power cord is connected to the AC source.

During the initial self-test and loading of the latest settings ,,Booting…" appears on the LCD screen. After the self-test, the router reloads its last configuration and it is ready to use. In case of hardware failure, an error message is displayed.

*Info:* *After switching ON, the router reloads the latest settings that were used before it was turned off. The router has an internal emergency memory that stores all current settings and tie configurations. This memory is independent from presets and invisible for the user. This built-in feature helps the system to be ready immediately in case of power failure or accidental power down.*

## 3.2. FRONT PANEL OPERATIONS

### 3.2.1. TAKE / AUTOTAKE modes

The router has two different switching modes: TAKE and AUTOTAKE. If the TAKE button is unlit, TAKE mode is active. When the TAKE button continuously illuminates green, AUTOTAKE mode is selected.

Press and hold the TAKE button for two seconds to change between TAKE and AUTOTAKE modes.

TAKE mode allows the user to make multiple connections and deselections at once. This mode is useful when time delay is not allowed during multiple switching. After selecting the inputs and outputs, all of the switching actions occur at once.

AUTOTAKE mode is useful when immediate actions must be done or fast switching is needed between sources on a particular destination. In this mode switching occurs immediately upon pressing one of the input selector buttons.

### 3.2.2. CONTROL LOCK

Front panel button operation can be enabled or disabled using CONTROL LOCK button, while RS-232/422 control is still enabled. If the button is unlit, front panel button operation is enabled. If it continuously illuminates red then front panel operations are inhibited.

Press and release CONTROL LOCK button to toggle between the control lock states.

### 3.2.3. SWITCHING

**Creating a connection or multiple connections in TAKE mode**

1. First press and release the selected source button. The pressed source button and all destination buttons, which are currently connected to this source, will light up. The remaining unlit destination buttons are not connected to this source. This is an informative display about current status of the selected input. (view only)
2. Press and release the selected unlit destination button or buttons, which have to be connected to the selected source. The preselected destination button(s) start(s) blinking.
3. Press and release TAKE button to execute the tie or ties. Now the selected input is switched to the selected output or multiple outputs.

**Deselecting or muting in TAKE mode**

1. First press and release the selected source button. The pressed source button and all destination buttons, which are currently connected to this source, will light up. The remaining unlit destination buttons are not connected to this source. This is an informative display about current status of the selected input. (view only)
2. Press and release the selected, green illuminated destination button which has to be disconnected from the selected source. The corresponding button(s) of the pressed destination or multiple destinations will turn dark.
3. Press and release TAKE button to execute disconnection.

*Info:* *Deselected destinations are disconnected from any source, thus output devices will display black image or "no signal" message and may automatically turn off.*

*Info:* *Multiple switching and deselecting actions can be done simultaneously, during only one TAKE action.*

**Creating a connection in AUTOTAKE mode**

1. Press and release the selected destination button. The pressed destination button, and the actually connected source button are illuminating green. If no source is connected, (the output is muted) no source button will light up.
2. Press and release the selected input button. The switch action will be executed immediately. Switching between sources to the selected destination can be done directly.

**Deselecting or muting in AUTOTAKE mode**

1. Press and release the selected destination button. The pressed destination button, and the actually connected source button are illuminating green. If no source is connected, (the output is muted) no source button will light up.
2. Press and release the active, green illuminating source button. The output is muted.

*Info:* *Deselected destinations are disconnected from any source, thus output devices will display black image or "no signal" message and may automatically turn off.*

### 3.2.4. SAVE or LOAD PRESETS

The unit has 32 user programmable presets. Each preset stores a configuration regarding all input connections for all outputs. All presets are stored in a non-volatile memory. The router keeps presets even in case of power down. Memory numbers are assigned to source buttons. (1 to 32 in MX32x32 frame, 1 to 16 in MX16x16 frame or 1 to 8 in the MX8x8 family.

**Saving a Preset in TAKE mode**

1. Press and release SAVE PRESET button.
2. Press and release the desired source (memory address) button (source 1 to 32 or to 16)
3. Press and release TAKE button. Now the current configuration is stored in selected memory.

*Info:* *Preset save action always stores the current configuration for all outputs.*

**Loading a Preset in TAKE mode**

1. Press and release LOAD PRESET button.
2. Press and release the desired source (memory address) button (source 1 to 32 or to 16)
3. Press and release TAKE button. Now the selected preset is loaded.

*Info:* *Loading a preset always modifies all output states.*

**Saving a Preset in AUTOTAKE mode**

1. Press and release SAVE PRESET button.
2. Press and release the desired source (memory address) button (source 1 to 32 or to 16). Now the current configuration is stored in the selected memory.

*Info:* *Preset save action always stores the current configuration for all outputs.*

**Loading a Preset in AUTOTAKE mode**

1. Press and release LOAD PRESET button.
2. Press and release the desired source (memory address) button (source 1 to 32 or to 16). Now the selected preset is loaded.

*Info:* *Loading a preset always modifies all output states.*

### 3.2.5. VIEW crosspoint state

User can check the current switching status on the front panel using front panel buttons. View mode is slightly different in TAKE or AUTOTAKE modes because of different switching philosophy of the two modes.

*Info:* *View mode does not mean, that the router has to be switched in different modes, viewing and switching can be done after each other, without pressing any special buttons.*

**View current state in TAKE mode**

If the router is in TAKE mode, user can verify both input and output connections. In TAKE mode no accidental change can be done unless TAKE button is pressed.

Press and release a source button. Now the selected source button and all destination buttons that are currently connected to the selected source will light up. This informative display will remain active for 5 seconds, then all buttons turn unlit.

If every source, destination and TAKE button is unlit (the unit is in TAKE mode, and no input was selected in the last 5 seconds), press and release a destination button to see its current state. Now the source button, which is connected to the selected destination, will light up. If no source button is illuminated, the selected destination is in muted state. Upon pressing another destination button, the last state of the destination can be seen.

**View current state in AUTOTAKE mode**

In AUTOTAKE mode only states of destinations can be viewed.

Press and release the required destination button. Now the source button, which is connected to the selected destination, will light up. If no source button is illuminated, the selected destination is in muted state. Upon pressing another destination button, the last state of the destination can be seen.

### 3.2.6. VIEW live inputs and attached monitors

1. Press and release SOURCE PRESENT button.
2. Input buttons will light up indicating that active TMDS clock signal is present on respective input connectors.

   Output buttons will light up indicating that a powered monitor is attached to the output. The output circuit senses TMDS pull-up resistors on monitor side.
3. Press and release SOURCE PRESENT button to quit this mode.

### 3.2.7. OUTPUT LOCK

Using Lightware routers it is possible to lock a destination. This feature prevents an accidental switching to the locked destination in case of an important signal. Locking a destination means that no input selection or muting action can be executed on that particular destination.

Destinations can be independently locked or unlocked. Locking a destination does not affect other destinations.

**Output Lock in TAKE mode**

1. Press and release the desired destination button. Now the selected destination button and the currently configured source button light up. (view mode)
2. Press and release the Output Lock button. Now the Output Lock button lights up in red.
3. Press and release TAKE button. The desired destination is now locked.

**Unlock in TAKE mode**

1. Press and release the desired destination button, which was previously locked. Now the selected destination button, the currently configured source button, and the Output Lock button light up.
2. Press and release the Output Lock button (deselect). Now the Output Lock button turns off, however the locking function has not been cancelled yet.
3. Press and release TAKE button. The desired destination is now unlocked.

**Output Lock in AUTOTAKE mode**

1. Press and release the desired destination button. Now the selected destination button and the currently configured source button light up. (view mode)
2. Press and release the Output Lock button. Now the Output Lock button lights up in red, and lock function is activated. No source can be switched to the locked destination.

**Unlock in AUTOTAKE mode**

1. Press and release the desired destination button, which was previously locked. Now the selected destination button, the currently configured source button, and the Output Lock button light up.
2. Press and release the Output Lock button (deselect). Now the Output Lock button turns off, and the locking function has been cancelled.

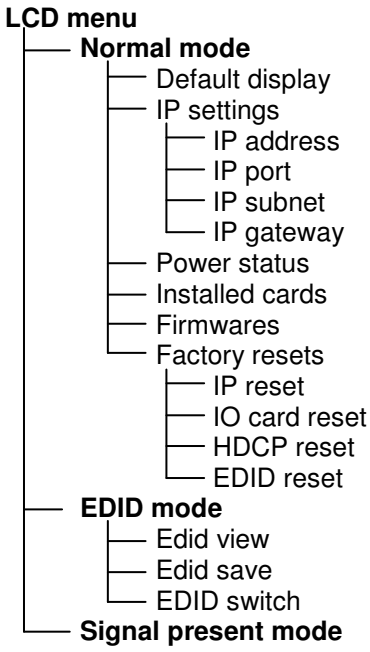
## 3.3. Front panel LCD Menu operation

### 3.3.1. Basic concept

There are three operation modes of the LCD menu:

| | |
|---|---|
| **Normal mode** | Most settings can be done in this mode. It activates after powering on. |
| **EDID mode** | Use this mode to set up the emulated EDID on the inputs, learn EDID form the outputs or to view the EDID memory. This mode is activated when EDID button is illuminated. You can enter this mode or exit by pressing the EDID button. |
| **Signal present mode** | This mode is for checking the presence of the display devices and incoming signals. It is activated when SIGNAL PRESENT button is illuminated. You can enter this mode or exit by pressing SIGNAL PRESENT button. |

Press the LEFT or the RIGHT button to jump between the menus and parameters Use the ENTER or TAKE buttons to enter a menu or execute an item. The UP and DOWN buttons modify the values if modification is enabled.



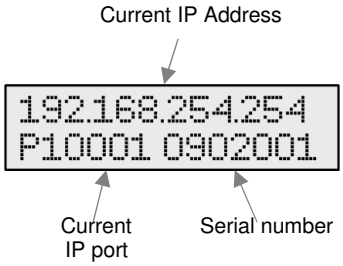

***LCD menu structure***

### 3.3.2. Normal mode

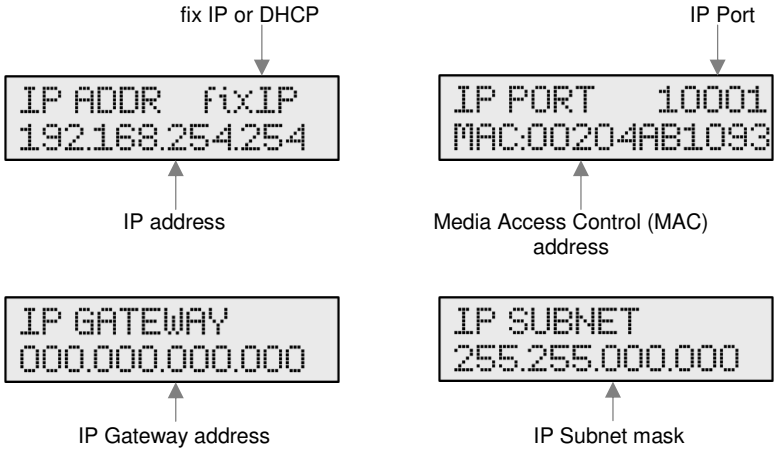
The normal mode has six submenus that can be selected by pressing LEFT and RIGHT buttons.

**Default display**

Default display activates after power up or after 40sec idle from any menu in normal mode. This screen shows the current IP address, the IP port and the serial number of the matrix.




**IP Settings**

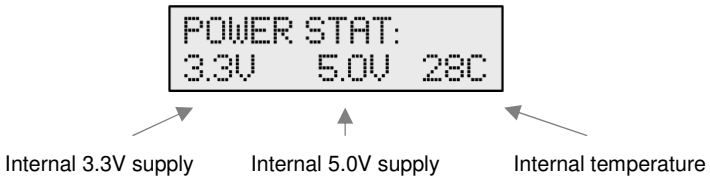



You can specify the LAN settings in the IP settings menu. Here you can set the IP address, the IP Port, the IP subnet mask and the IP gateway. Browsing between these settings is done with the LEFT and RIGHT buttons and selection is done by pressing ENTER. After the desired modification, you have to press ENTER again and select the SAVE&EXIT item in the menu, then the new settings will be activated after a few seconds. If you select the EXIT NO SAVE menu, then no modifications will be made.

It is possible to configure the system to use DHCP server by selecting DHCP instead of fixIP.

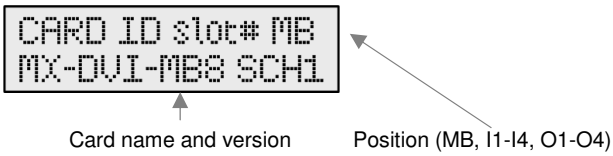
*Note:* *New settings cannot be applied while an active connection is alive on the Ethernet port. If you get ,,OPERATION FAILED" message then please disconnect the remote TCP/IP sockets and try again.*

**Power status**




You are able to check here the DC voltages and the internal temperature. If these values are out of the safe interval, you will get a warn message on the LCD screen regardless of what menu is selected.

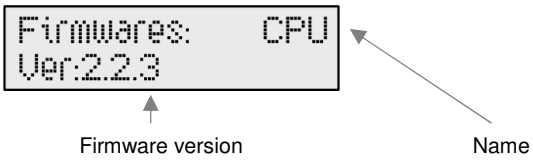
**Cards ID slot**




This submenu shows the hardware description strings of the installed cards. You can view the installed cards by pressing UP and DOWN buttons. The position is shown in the top right corner. The possible values are:

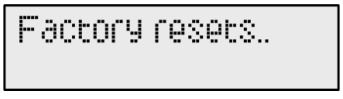
| | |
|---|---|
| **MB** | Motherboard |
| **I1, I2, I3, I4** | Input card slots |
| **O1, O2, O3, O4** | Output card slots |

**Firmwares**




It shows the firmware version numbers of the CPU, EDID, web server, web content and the front panel control board(s). Press the UP and DOWN buttons to view the desired firmware.

**Factory resets**




Here you are able to recover the original factory settings if something went wrong. There are more factory reset options that you can select:

| | |
|---|---|
| **IP reset** | It resets the IP settings to factory default. (192.168.254.254:10001, mask:255.255.0.0, no gateway) |
| **IO Card reset** | Resets all settings related to the IO cards except the EDID routings. |
| **HDCP reset** | Resets the internal HDCP key cache. It is useful when a source device fails because of too many downstream connections. |

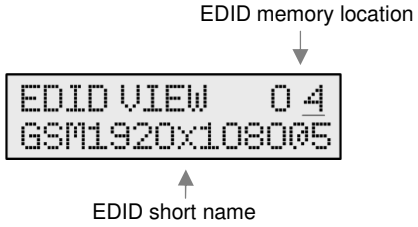
| | |
|---|---|
| **EDID reset** | Resets the EDID on all input ports to factory default. (LWR 1920x1200@59.55Hz UniversalEDID) |

### 3.3.3. EDID mode

EDID mode is active when the EDID button is illuminated on the front panel. To enter or to exit from this mode press and release the EDID button.

There are three submenus in this mode, use the RIGHT, LEFT and ENTER buttons to reach them.

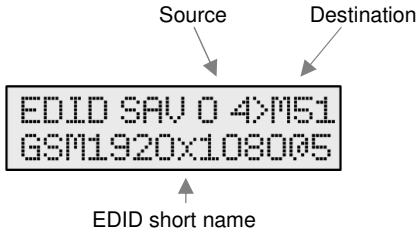
**EDID view**




You can select an EDID with the UP and DOWN buttons and view it's short name. The short name contains the three-character long manufacturer code (so called PNPID), the resolution and frame rate of the preferred timing, detailed timing and the model name descriptor string. The following EDIDs can be selected:

| | |
|---|---|
| **O1 - O32** | The EDID of the currently attached or the last attached sink device. |
| **I1 - I32** | The emulated EDIDs of the input ports. |
| **M1 - M50** | The stored Lightware EDIDs. |
| **M51 - M100** | 50 user programmable memory slots. |

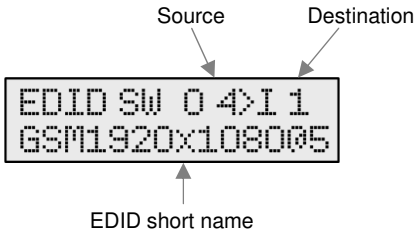
**EDID save**




Lightware matrices have 50 user programmable EDID memory slots. You can learn and save an EDID from any output to one of the M51-M100 memory slots. You have to select the desired output and the desired destination, then press ENTER. The EDIDs are stored in the non-volatile emergency memory. By default all user programmable memory slots are empty.

Press the EDID button to exit.

**EDID switch**

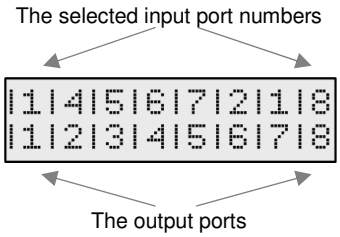



This menu is used to select the emulated EDIDs on the inputs. You have to specify the EDID source and the desired input port then press ENTER.

If you select an output port as source then dynamic routing will be performed: the input will follow the changes of the output port. If there is no connected device on the selected output, then the EDID of the last attached sink will be emulated.

Press the EDID button to exit this menu.

### 3.3.4. Signal Present mode




Signal present mode is active when Signal present button is illuminated. To enter or exit from Signal present mode you have to press this button.

The LCD screen shows the actual connections between the inputs and outputs. The second line represents the output and the first line represents the connected inputs. Only 8 connections can be displayed simultaneously. If your matrix has greater I/O sizes, press the LEFT and RIGHT buttons to switch between the pages.

If you are in Signal Present mode, the source and destination buttons show the actual state of the matrix. If a source button is illuminated then SCDT is present on that source. If a destination button is illuminated then a powered display is attached to this output (Hot Plug Detect signal is present). You can quickly check the cable connections with this feature.

# 4. Programmer's reference

### Port settings

MX32x32DVI-Pro can be ordered with either RS-232 or RS-422 communication port. The port settings are done during manufacturing. D-sub connector pin assignments can be found in chapter 2.8.6.

The device uses standard RS-232 interface with the following settings:

**9600** Baud, **8** data bit, **N**o parity, **1** stop bit

null modem cable

The matrix also has a built-in ethernet port with TCP/IP support. See the chapter about IP settings on page 34 to see how you can set the port number and IP address. Only one socket is allowed on the Ethernet port at one time, however it is possible to use the serial and the LAN connection simultaneously. In this case, the router initiated notifications and the answers for all commands will be sent to both interfaces.

### Changing and viewing protocols

MX32x32DVI-Pro is equipped with multiple router protocols.

1. Switch the router to TAKE mode if it was previously used in AUTOTAKE mode by pressing TAKE button for 2 seconds. (TAKE will not be illuminated continuously)
2. Press and release Control Lock. (Control Lock button is continuously illuminated red)
3. Press and hold Output Lock button. Now one of the source buttons will light up (view protocol):

   If Source #1 button is illuminated: Lightware protocol is active

   If Source #2 button is illuminated: Protocol#2 is active
4. While Output Lock is held, press the desired Source button according to the new protocol. The desired Source button starts blinking and the router performs a reset. Now the new protocol is active.

The protocol description hereinafter stands for Lightware protocol.

The matrices accept commands surrounded by curly brackets - { } - and responds with data surrounded by round brackets - ( ) – but only if a command was successfully interpreted. Input, output numbers and values must be sent as two digit ASCII numbers.

### Legend for control commands:

| | | |
|---|---|---|
| <in> | = | input number in 1 or 2 digit ASCII format (01,5,07,16 etc.) |
| <out> | = | output number in 1 or 2 digit ASCII format |
| <in²> | = | input number in 2 digit ASCII format (01, 02, 10, 12 etc.) |
| <out²> | = | output number in 2 digit ASCII format (01, 02, 10, 12 etc.) |
| <loc> | = | location number in 1, 2 or 3 digit ASCII format |
| <id> | = | id number in 1 or 2 digit ASCII format |
| <id²> | = | id number in 2 digit ASCII format |

| | | |
|---|---|---|
| CrLf | = | Carriage return, Line feed (0x0D,0x0A) |
| • | = | space character (0x20) |
| → | = | each command issued by the controller |
| ← | = | each response received from the router |

## 4.1. Switching and control commands

### 4.1.1. Switch one input to one output

**Description:** Switch input <in> to output <out>.

| | |
|---|---|
| → | {<in>@<out>} |
| ← | (O<out²>●I<in²>)CrLf |

**Example:** Connect input 1 to output 5.

→ {1@5}
← (O05 I01)CrLf

*Info:* *Response <in>, <out> are always in 2 digit format*

### 4.1.2. Switch one input to all outputs

**Description:** Switch input <in> to all outputs.

| | |
|---|---|
| → | {<in>@O} |
| ← | (I<in²>●All)CrLf |

**Example:** Switch input 1 to all outputs.

→ {01@O}
← (I01 All)CrLf

### 4.1.3. View connection on the specified output

Obsolete! Use {VC} instead

**Description:** View connection on output <out>.

| | |
|---|---|
| → | {?<out>} |
| ← | (O<out²>●I<in²>)CrLf |

**Example:** View connection on output 5.

→ {?05}
← (O05 I01)CrLf

### 4.1.4. View connection on all outputs

**Description:** Indexes show the actual output and the number at the given index shows which input is connected to it. If value O5 equals 04 it means that output 5 is connected to input 4.

| | **MX32x32** |
|---|---|
| → | {VC} |
| ← | (*ALL●O1●O2●O3●O4●O5●O6●O7●O8●O9●O10●O11●O12●O13●O14●O15●O16●*O17●O18●O19●O20●O21●O22●O23●O24●O25●O26●O27●O28●O29●O30●O31●O32)CrLf |
| | **MX16x16** |
| → | {VC} |
| ← | (*ALL●O1●O2●O3●O4●O5●O6●O7●O8●O9●O10●O11●O12●O13●O14●O15●O16*)CrLf |
| | **MX8x8** |
| → | {VC} |
| ← | (*ALL●O1●O2●O3●O4●O5●O6●O7●O8*)CrLf |

**Example 1:** View connection on all outputs

**Legend 1**: output 1 is connected to input 1, output 2 is connected to input 2...output 32 is connected to input 32, this is the so-called „diagonal pattern".

| | | |
|---|---|---|
| **MX32x32** | → | {VC} |
| | ← | (ALL 01 02 03 04 05 06 07 08<br>09 10 11 12 13 14 15 16<br>17 18 19 20 21 22 23 24<br>25 26 27 28 29 30 31 32 )CrLf |
| **MX16x16** | → | {VC} |
| | ← | (ALL 01 02 03 04 05 06 07 08<br>09 10 11 12 13 14 15)CrLf |
| **MX8x8** | → | {VC} |
| | ← | (ALL 01 02 03 04 05 06 07 08)CrLf |

*Info:* *Note that a space character is sent after the last output*

*Info:* *If an output is locked, muted, or both (locked AND muted), the response format changes. If outputs are muted you get a letter 'M', if locked a letter 'L' and if muted and locked at the same time 'U' before the 2 digit numbers.*

*Info:* *The router will always respond 32 output states regardless of the installed output cards, as the number of outputs correlates to the frame and not to the number of installed outputs.*

**Example 2:**

**Legend 2:**
The connections are almost the same as in example 1, but output 1 is muted, output 2 is locked to input 2 and output 3 is muted, and locked to input 3.

| | | |
|---|---|---|
| **MX32x32** | → | {VC} |
| | ← | (ALL M01 L02 U03 04 05 06 07 08<br>09 10 11 12 13 14 15 16<br>17 18 19 20 21 22 23 24<br>25 26 27 28 29 30 31 32 )CrLf |
| **MX16x16** | → | {VC} |
| | ← | (ALL M01 L02 U03 04 05 06 07 08<br>09 10 11 12 13 14 15)CrLf |
| **MX8x8** | → | {VC} |
| | ← | (ALL M01 L02 U03 04 05 06 07 08)CrLf |

### 4.1.5. View mutes on all outputs

**Description**: The length of the response depends on the number of outputs installed in the router. The response above presumes a router having 32 outputs. Indexes show the actual output and the number at the given index shows its state. If the value M5 equals 1, it means that output 5 is muted, if 0, output 5 is not muted.

| | | |
|---|---|---|
| **MX32x32** | → | {VM} |
| | ← | (MUT●*M1*●*M2*●*M3*●*M4*●*M5*●*M6*●*M7*●*M8*●*M9*●*M10*●*M11*●*M12*●*M13*●*M14*●*M15*●*M16*●M17●M18●M19●M20●M21●M22●M23●M24●M25●M26●M27●M28●M29●M30●M31●M32)CrLf |
| **MX16x16** | → | {VM} |
| | ← | (MUT●*M1*●*M2*●*M3*●*M4*●*M5*●*M6*●*M7*●*M8*●*M9*●*M10*●*M11*●*M12*●*M13*●*M14*●*M15*●*M16*)CrLf |
| **MX8x8** | → | {VM} |
| | ← | (MUT●*M1*●*M2*●*M3*●*M4*●*M5*●*M6*●*M7*●*M8*)CrLf |

**Example:** Output 1 and 4 are muted while the other outputs are not muted.

| | | |
|---|---|---|
| **MX32x32** | → | {VM} |
| | ← | (MUT 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)CrLf |
| **MX16x16** | → | {VM} |
| | ← | (MUT 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0)CrLf |
| **MX8x8** | → | {VM} |
| | ← | (MUT 1 0 0 1 0 0 0 0)CrLf |

### 4.1.6. Mute specified output

**Description**: Mute output <out>.

| | |
|---|---|
| → | {#<out>} |
| ← | (MUT<out²>)CrLf |

**Example**: Mute output 5.

→ {#05}
← (MUT05)CrLf

### 4.1.7. Unmute specified output

**Description**: Unmute output <out>.

| | |
|---|---|
| → | {+<out>} |
| ← | (UMT<out²>)CrLf |

**Example:** Unmute output 5. Now output 5 is switched to the input it was connected to prior to the mute.

→ {+05}
← (UMT05)CrLf

### 4.1.8. Lock specified output

**Description:** Locks output <out>. No other input can be routed to this output until it is unlocked.

| | |
|---|---|
| → | {#><out> } |
| ← | (1LO<out²>)CrLf |

**Example:** Lock Output 11.

→ {#>11}
← (1LO11)CrLf

*Info:* *If an output is locked to an input, neither preset loading nor switching can modify this connection.*

### 4.1.9. Unlock specified output

**Description:** Unlocks output <out>. Presets can be loaded to this output and routing is working as well.

| | |
|---|---|
| → | {+<<out> } |
| ← | (0LO<out²>)CrLf |

**Example:** Unlock the previously locked output 11.

→ {+<11}
← (0LO11)CrLf

*Info:* *The router issues the above response regardless of the previous state of the output <out> (it was either locked or unlocked).*

### 4.1.10. Save preset to the specified memory location

**Description: Save current ties to preset zz.**

| | |
|---|---|
| → | {$<id>} |
| ← | (SPR<id²>)CrLf |

**Example**: Save current connections to preset memory 7.

→ {$07}
← (SPR07)CrLf

*Info:* *The router saves the mute state of the outputs as well.*

*Info:* *Lock states are not saved. Lock state is assigned to the physical output of the router. Presets don't affect output locks.*

### 4.1.11. Load preset from the specified location

**Description**: Load preset zz.

| | |
|---|---|
| → | {%<id>} |
| ← | (LPR<id²>)CrLf |

.

**Example**: Load connections previously saved to preset memory 7. All connections will be reloaded.

→ {%07}
← (LPR07)CrLf

*Info:* *The router loads the mute state of the outputs as well.*

*Info:* *Lock states are not loaded. Lock state is assigned to the physical output of the router. Presets don't affect output locks.*

### 4.1.12. View preset without loading

**Description:** View the specified preset without loading it.

| | |
|---|---|
| → | {VP#<id>=?} |
| ← | (VP#<id>=●01●02●03●... ●32)CrLf |

**Examples:**

| | | |
|---|---|---|
| **MX32x32** | → | {VP#1=?} |
| | ← | (VP#1= M01 L02 U03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 )CrLf |
| **MX16x16** | → | {VP#1=?} |
| | ← | (VP#1= M01 L02 U03 04 05 06 07 08 09 10 11 12 13 14 15)CrLf |
| **MX8x8** | → | {VP#1=?} |
| | ← | (VP#1= M01 L02 U03 04 05 06 07 08)CrLf |

### 4.1.13. Name Presets / Inputs / Outputs

**Description:** Allows storing names for each preset / input / output. Any 16-byte long string is allowed. All characters are converted to uppercase! The router accepts <id> greater than the current I/O setup but treats it as modulo output. So if <id> = 9 on a 8x8 router, then it will be treated as 1.

| | valid <id> field | | |
|---|---|---|---|
| | Preset | Input | Output |
| **MX32x32** | 1..32 | 1..32 | 1..32 |
| **MX16x16** | 1..32 | 1..16 | 1..16 |
| **MX8x8** | 1..32 | 1..8 | 1..8 |

Name a preset:

| | |
|---|---|
| → | {**PNAME**#<id>=<preset_name>} |
| ← | (**PNAME**#<id>=<preset_name>)CrLf |

**Example:**

→ {**PNAME**#1=first preset}
← (**PNAME**#1=FIRST PRESET)CrLf

Name an input:

| | |
|---|---|
| → | {**INAME**#<id>=<input_name>} |
| ← | (**INAME**#<id>=<input_name>)CrLf |

**Example:**

→ {**INAME**#1=first input}
← (**INAME**#1=FIRST INPUT)CrLf

Name an output:

| | |
|---|---|
| → | {**ONAME**#<id>=<output_name>} |
| ← | (**ONAME**#<id>=<output_name>)CrLf |

**Example:**

→ {**ONAME**#1=first output}
← (**ONAME**#1=FIRST OUTPUT)CrLf

### 4.1.14. Query names of Presets / Inputs / Outputs

**Description:** Each preset / input / output name can be read from the router.

Query a preset name:

| | |
|---|---|
| → | {**PNAME**#<id>=?} |
| ← | (**PNAME**#<id>=<preset_name>)CrLf |

**Example:**

→ {**PNAME**#1=?}
← (**PNAME**#1=Preset 1)CrLf

Query input name:

| | |
|---|---|
| → | {**INAME**#<id>=?} |
| ← | (**INAME**#<id>=<input_name>)CrLf |

**Example:**

→ {**INAME**#1=?}
← (**INAME**#1=Input 1)CrLf

Query output name:

| | |
|---|---|
| → | {**ONAME**#<id>=?} |
| ← | (**ONAME**#<id>=<output_name>)CrLf |

**Example:**

→ {**INAME**#1= ?}
← (**INAME**#1=Output 1)CrLf

### 4.1.15. Set default names of Presets / Inputs / Outputs

**Description:** Renames **all** preset / input / output names to the default setup Preset 1..32 / Input 1.. / Output 1.. respectively.

*Info:* *<id> field has no meaning here, but has to be a valid one!*

Set default preset names:

| | |
|---|---|
| → | {**PNAME**#<id>=!} |
| ← | (**PNAME**#<id>=Preset<id>)CrLf |

**Example:**

→ {**PNAME**#2=!}
← (**PNAME**#2=Preset 2)CrLf

Set default input names:

| | |
|---|---|
| → | {**INAME**#<id>=!} |
| ← | (**INAME**#<id>=Input<id>)CrLf |

**Example:**

→ {**INAME**#2=!}
← (**INAME**#2=Input 2)CrLf

Set default output names:

| | |
|---|---|
| → | {**ONAME**#<id>=!} |
| ← | (**ONAME**#<id>=Output<id>)CrLf |

**Example:**

| | |
|---|---|
| → | {**ONAME**#2=!} |
| ← | (**ONAME**#2=Output 2)CrLf |

### 4.1.16. Query IP settings

**Description:** IP setup can be retrieved from the router with this command.

| | |
|---|---|
| → | {IP_CONFIG=?} |
| ← | (IP_CONFIG=<id>●<ip_address>●<port>●<mask>●<gateway>)CrLf |

**Legend:**

| Identifier | Description | Default value |
|---|---|---|
| <id> | 0-fix IP, 7-DHCP | 0 |
| <ip_address> | IP address | 192.168.254.254 |
| <port> | IP port of the router | 10001 |
| <mask> | subnet mask | 255.255.0.0 |
| <gateway> | gateway address | 0.0.0.0 |

**Example:**

→ {IP_CONFIG=?}
← (IP_CONFIG=0 192.168.2.106 10001 255.0.0.0 192.168.2.1)CrLf

**Legend:** The router has a fix 192.168.2.106 IP address on the 255.0.0.0 subnet with a gateway on 192.168.2.1 and communicates over port no. 10001.

### 4.1.17. Reload factory default IP settings

**Description:** After issuing this command (either over serial or IP) the router will reload the factory default IP setup.

| | |
|---|---|
| → | {IP_CONFIG=**!**} |
| ← | (Changing IP configuration…)CrLf |
| | …4 second delay… |
| | … Beep Beep sound from the router… |
| ← | (DONE!)CrLf or (FAILED!)CrLf |

Parameters after successful command execution:

| Parameter | Value |
|---|---|
| IP address | 192.168.254.254 |
| port number | 10001 |
| Subnet mask | 255.255.0.0 |
| Gateway | 0.0.0.0 |

### 4.1.18. Load DHCP IP settings (only IP address!)

**Description:** After issuing this command (either over serial or IP) the router will reload the factory default IP setup.

| | |
|---|---|
| → | {IP_CONFIG=**D**} |
| ← | (Changing IP configuration…)CrLf |
| | …4 second delay… |
| | … Beep Beep sound from the router… |
| ← | (DONE!)CrLf or (FAILED!)CrLf |

Parameters after successful command execution:

| Parameter | Value |
|---|---|
| IP address | Acquired with DHCP |
| port number | unchanged |
| Subnet mask | unchanged |
| Gateway | unchanged |

## 4.2. Router Status Commands

### 4.2.1. View product type

**Description:** The router responds its name.

| | |
|---|---|
| → | {I} |
| ← | (PRODUCT_TYPE)CrLf |

**Example:**

| | | |
|---|---|---|
| **MX32x32** | → | {I } |
| | ← | (MX32X32DVI FRAME)CrLf |
| **MX16x16** | → | {I} |
| | ← | (MX16X16DVI FRAME)CrLf |
| **MX8x8** | → | {I} |
| | ← | (MX8X8DVI FRAME)CrLf |

### 4.2.2. View serial number

**Description**: The router responds its 8-digit serial number.

| | |
|---|---|
| → | {S} |
| ← | SN:<SERIAL_NUMBER>)CrLf |

**Example:** The serial number of the connected router is: 06050100.

→ {S}
← (SN:06050100)CrLf

*Info:* *Only the last 4 numbers are written onto the back of the router*

### 4.2.3. View Firmware version of the CPU

**Description:** View the CPU firmware revision. To view another controller's firmware revision see → '*Query* cards' firmware' {FC}.

| | |
|---|---|
| → | {F} |
| ← | (FIRMWARE_VERSION)CrLf |

**Example:** The connected router's CPU has a firmware version of 1.10.

→ {F}
← (FW:1.1.0)CrLf

### 4.2.4. View Router's health

**Description:** Shows power, temperature and fan status of the router.

| | | |
|---|---|---|
| **MX32x32** | → | {ST} |
| | ← | (STAT●<V1>●<V2>●<V3>●<temp>●<rpm1>● <rpm2>)CrLf |
| **MX16x16** | → | {ST} |
| | ← | (STAT●<V1>●<V2>●<V3>●<temp>●<rpm1>● <rpm2>)CrLf |
| **MX8x8** | → | {ST} |
| | ← | (STAT●<V1>●<V2>●<temp>)CrLf |

**Legend:**

| Identifier | description | default value |
|---|---|---|
| <V1> | System voltage | 3.3V |
| <V2> | EDID voltage | 5.0V |
| <V3> | FAN voltage | 12V |
| <temp> | System Temp.in °C | 24°C |
| <rpm1> | FAN1 speed | 1600RPM |
| <rpm2> | FAN2 speed | 1600RPM |

**Example:**

| | | |
|---|---|---|
| **MX32x32** | → | {ST} |
| | ← | (STAT 3.2V 5.0V 12.1V 23C 1629RPM 1600RPM)CrLf |
| **MX16x16** | → | {ST} |
| | ← | (STAT 3.2V 5.0V 12.1V 23C 1629RPM 1600RPM CrLf |
| **MX8x8** | → | {ST} |
| | ← | (STAT 3.2V 5.0V 23C)CrLf |

### 4.2.5. View Installed I/O cards' hardware

**Description:** Shows the hardware name and revision of the installed cards.

**Example:**

| | **MX32x32** |
|---|---|
| → | {IS} |
| ← | *(SL#●0●MB_DESCRIPTOR)CrLf* |
| ← | *(SL#●1●OUTPUT_CARD_DESC)CrLf* |
| ← | *(SL#●2●OUTPUT_CARD_DESC)CrLf* |
| ← | (SL#●3●OUTPUT_CARD_DESC )CrLf |
| ← | (SL#●4●OUTPUT_CARD_DESC)CrLf |
| ← | *(SL#●5●INPUT_CARD_DESC)CrLf* |
| ← | *(SL#●6●INPUT_CARD_DESC)CrLf* |
| ← | (SL#●7●INPUT_CARD_DESC)CrLf |
| ← | (SL#●8●INPUT_CARD_DESC)CrLf |
| | **MX16x16** |
| → | {IS} |
| ← | *(SL#●0●MB_DESCRIPTOR)CrLf* |
| ← | *(SL#●1●OUTPUT_CARD_DESC)CrLf* |
| ← | *(SL#●2●OUTPUT_CARD_DESC)CrLf* |
| ← | (SL#●3●EMPTY_SLOT)CrLf |
| ← | (SL#●4●EMPTY_SLOT)CrLf |
| ← | *(SL#●5●INPUT_CARD_DESC)CrLf* |
| ← | *(SL#●6●INPUT_CARD_DESC)CrLf* |
| ← | (SL#●7●EMPTY_SLOT)CrLf |
| ← | (SL#●8●EMPTY_SLOT)CrLf |
| | **MX8x8** |
| → | {IS} |
| ← | *(SL#●0●MB_DESCRIPTOR)CrLf* |
| ← | *(SL#●1●OUTPUT_CARD_DESC)CrLf* |
| ← | *(SL#●2●*EMPTY_SLOT*)CrLf* |
| ← | (SL#●3●EMPTY_SLOT)CrLf |
| ← | (SL#●4●EMPTY_SLOT)CrLf |
| ← | *(SL#●5●INPUT_CARD_DESC)CrLf* |
| ← | *(SL#●6●* EMPTY_SLOT*)CrLf* |
| ← | (SL#●7●EMPTY_SLOT)CrLf |
| | (SL#●8●EMPTY_SLOT)CrLf |

| | **MX32x32** |
|---|---|
| → | {IS} |
| ← | (SL# 0 MX-DVI-MB32 SCH_1.1 PCB_1.1 )CrLf |
| ← | (SL# 1 MX-DVI-HDCP-OB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 2 MX-DVI-HDCP-OB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 3 MX-DVI-HDCP-OB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 4 MX-DVI-HDCP-OB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 5 MX-DVI-HDCP-IB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 6 MX-DVI-HDCP-IB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 7 MX-DVI-HDCP-IB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 8 MX-DVI-HDCP-IB SCH_1.1 PCB_1.1)CrLf |
| | **MX16x16** |
| → | {IS} |
| ← | (SL# 0 MX-DVI-MB16 SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 1 MX-HDMI-OB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 2 MX-HDMI-OB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 3 EMPTY SLOT)CrLf |
| ← | (SL# 4 EMPTY SLOT)CrLf |
| ← | (SL# 5 MX-HDMI-IB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 6 MX-HDMI-IB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 7 EMPTY SLOT)CrLf |
| ← | (SL# 8 EMPTY SLOT)CrLf |
| | **MX8x8** |
| → | {IS} |
| ← | SL# 0 MX-DVI-MB8 SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 1 MX-DVI-HDCP-OB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 2 EMPTY SLOT)CrLf |
| ← | (SL# 3 EMPTY SLOT)CrLf |
| ← | (SL# 4 EMPTY SLOT)CrLf |
| ← | (SL# 5 MX-DVI-HDCP-IB SCH_1.1 PCB_1.1)CrLf |
| ← | (SL# 6 EMPTY SLOT)CrLf |
| ← | (SL# 7 EMPTY SLOT)CrLf |
| ← | (SL# 8 EMPTY SLOT)CrLf |

**Legend (MX32x32 Frame):** The router has 4 input and 4 output cards (32x32) installed. All cards are DVI-HDCP.

**Legend (MX16x16 Frame):** The router has 2 input and 2 output cards (16x16) installed.

**Legend (MX8x8 Frame):** The router has 1 input and 1 output cards (8x8) installed.

### 4.2.6. View installed controllers' firmware

**Description:** Shows the firmware revisions of the installed programmed controllers

| | |
|---|---|
| → | {FC} |
| ← | (CF CARD_FIRMWARE)CrLf |

**Example:**

| | | |
|---|---|---|
| **MX32x32** | → | {FC} |
| | ←<br>←<br>← | (CF MX-CP FW:1.0.2 @ 0X10)CrLf<br>(CF MX-CP FW:1.0.2 @ 0X12)CrLf<br>(CF MX-DVI-EDID FW:1.1.0 @ 0X20)CrLf |
| **MX16x16** | → | {FC} |
| | ←<br>← | (CF MX-CP FW:1.0.2 @ 0X10)CrLf<br>(CF MX-DVI-EDID FW:1.1.0 @ 0X20)CrLf |
| **MX8x8** | → | {FC} |
| | ←<br>← | (CF MX-CP FW:1.0.2 @ 0X10)CrLf<br>(CF MX-DVI-EDID FW:1.1.0 @ 0X20)CrLf |

### 4.2.7. View current control protocol

**Description:** Shows the RS-232, TCP/IP control protocol.

| | |
|---|---|
| → | {P_?} |
| ← | (CURRENT PROTOCOL = #1)CrLf |

### 4.2.8. Set current control protocol

**Description:** Sets the current RS-232, TCP/IP control protocol (Default is '1')

| | |
|---|---|
| → | {P_x} |
| ← | (PROTOCOL #<x> SELECTED!)CrLf |

## 4.3. EDID router commands

### 4.3.1. Route EDID to the selected input (static)

**Description:** Copies EDID from location <loc> to input <in>. <loc> must be 1..100

| | |
|---|---|
| → | {<in>:<loc>} |
| ← | (E_SW_OK)CrLf |
| ← | (E_S_C) CrLf |

Example:

→ {5:10}
← (E_SW_OK)CrLf
← (E_S_C) CrLf

*Note:* *(E_S_C) arrives only if the new and the old EDID don't match.*

### 4.3.2. Route EDID to the selected input (dynamic)

**Description:** It copies EDID from location <loc> to input <in>. Location <loc> should be 101..132 as opposed to static routing where <loc> should be between 1..100.

| | |
|---|---|
| → | {<in>:<loc>} |
| ← | (E_SW_OK)CrLf |
| ← | (E_S_C) CrLf |

*Info:* *Inputs 1..32 are mapped to logical addresses 101..132*

After choosing dynamic EDID routing for one (or all inputs) the router will follow the EDID changes that occur on the output it is connected to.

Example:

→ {4:101}
← (E_SW_OK)CrLf
← (E_S_C) CrLf

After issuing this command the router will automatically copy the new EDID on output1 (remember logical address = 101) if it changes.

### 4.3.3. Route one EDID to all inputs

**Description:** It copies EDID from the selected location <loc> to all inputs.

| | |
|---|---|
| → | {A:<loc>} |
| ← | (E_SW_OK)CrLf |
| ← | (E_S_C) CrLf |

**Example:**

→ {A:48}
← (E_SW_OK)CrLf
← (E_S_C) CrLf

### 4.3.4. View EDID switch status on all inputs

**Description:** Indexes show the actual input and the number at the given index (<in1>..<inN>) shows which EDID is switched to that particular input where N represents the maximal input number of the given configuration.

| | |
|---|---|
| → | {VEDID} |
| ← | (VEDID●<in1>●<in2>●…●<inN>)CrLf |

*Info:* *The length of <in1>..<inN> is always 3 digits! (001, 010, 100)*

Logical EDID locations:

| | Factory presets | User presets | Outputs | Inputs |
|---|---|---|---|---|
| **MX32x32** | 1..50 | 51..100 | 101..132 | 133..164 |
| **MX16x16** | 1..50 | 51..100 | 101..116 | 133..148 |
| **MX8x8** | 1..50 | 51..100 | 101..108 | 133..140 |

### 4.3.5. Save EDID from output to memory location (Learn EDID)

**Description:** Learn EDID from the specified output <out> to the specified location <loc>.

| | |
|---|---|
| → | {<out>><loc>} |
| ← | (E_SW_OK)CrLf |
| ← | (E_S_C) CrLf |

**Example:**

→ {24>51}
← (E_SW_OK)CrLf
← (E_S_C) CrLf

### 4.3.6. View EDID validity table

**Description:** Shows EDID validity table, which contains information about the EDID states.

| | |
|---|---|
| → | {wv} |
| ← | (EV●VALIDITY_TABLE)CrLf |

If a changed EDID is queried by the *wh* command (see the next section), its value returns to '1'.

**Example**

| | **MX32x32** |
|---|---|
| → | {WV} |
| ← | *(EV 11111111111111111111111111111111111111111111111111111111100033011000000000000000000000000000000000000000000000133111111111111111111111111111111111111111111111331111111111111111)CrLf* |
| | **MX16x16** |
| → | {WV} |
| ← | *(EV 11111111111111111111111111111111111111111111111111111111100033011000000000000000000000000000000000000000000000133111111111111100000000000000000001111111111113311000000000000000)CrLf* |
| | **MX8x8** |
| → | {WV} |
| ← | *(EV 11111111111111111111111111111111111111111111111111111111100033011000000000000000000000000000000000000000000000133111110000000000000000000000000001111111110000000000000000000000000)CrLf* |

**Legend:**

| Value | Description |
|---|---|
| **'0'** | invalid EDID |
| **'1'** | valid EDID |
| **'3'** | changed EDID |

### 4.3.7. View EDID header

**Description:** EDID_HEADER consist of 3

| | |
|---|---|
| → | {wh<loc>} |
| ← | (EH#<loc>●EDID_HEADER)CrLf |

fields:

| | |
|---|---|
| **PNPID code** | The three letter abbreviation of the manufacturer |
| **Preferred resolution** | The resolution and refresh rate stored in the preferred detailed timing block. |
| **Name** | The name of display device stored in product descriptor. |

*Note:* *If a CEA extension is present in the EDID, HDMI capable sources such as top-boxes and BD-players will use the short video descriptors instead of preferred detailed timing block in order to determine the type of the sent video. Please refer the standards for more details.*

**Example:**

Show the emulated EDID on DVI input#1 (for more information see session EDID Management: using EDID Router)

| | | |
|---|---|---|
| **MX32x32** | → | {WH133} |
| | ← | (EH#133 NEC 1600X1200@60 LCD2170NX)CrLf |
| **MX16x16** | → | {WH117} |
| | ← | (EH#117 NEC 1600X1200@60 LCD2170NX)CrLf |
| **MX8x8** | → | {WH109} |
| | ← | (EH#109 NEC 1600X1200@60 LCD2170NX)CrLf |

**Legend:**

| | |
|---|---|
| EDID manufacturer: | NEC |
| Preferred resolution: | 1600X1200@60 |
| Display device's name: | 60 LCD2170NX |

### 4.3.8. Upload EDID content from the router

**Description:** EDID hex bytes can be read directly. The router will issue the whole content of the EDID present on memory location <loc> (256 bytes).

| | |
|---|---|
| → | {we<loc>} |
| ← | (EB#<loc>●B1●B2●..B256)CrLf |

**Legend:** B1..B256 are space separated hex characters represented in ASCII format.

**Example:** → *{we1}*

← *(EB#1 00 FF FF FF FF FF FF 00 32 F2 00 00 00 .. .. .. 00 92)*

### 4.3.9. Download EDID content to the router

**Description:** EDID hex bytes can be written directly to the user programmable memory locations (locations #51...#100).

**Sequence:**

- Prepares the router to accept EDID bytes to the specified location <loc> {WL#<loc>}
- Router responds that it is ready to accept EDID bytes (E_L_S)CrLf
- Send 1 block of EDID (1 block consist of 8 bytes of hex data represented in ASCII format) {WB#1●B1●B2●B3●B4●B5●B6●B7●B8}
- The router acknowledges (EL#●)
- Send another 31 blocks of EDID (32 altogether)
- After the last acknowledge, the router signals that the EDID status has changed (E_S_C) CrLf

| | |
|---|---|
| → | {WL#<loc>} |
| ← | (E_L_S)CrLf |
| → | {WB#1●B1● B2 ●B3●B4●B5●B6●B7●B8} |
| ← | (EL#●)CrLf |
| → | {WB#2●B9● B10 ●B11●B12●B13●B14●B15●B16} |
| ← | (EL#●) CrLf |
| : : | : : |
| → | {WB#248●B249● B250 ●B251●B252●B253●B254●B255●B256} |
| ← | (EL#●) CrLf |
| ← | (E_S_C) CrLf |

## 4.4. Router Initiated commands

### 4.4.1. EDID status changed*

**Description:** This is sent after all commands that change the EDID (EDID copy, EDID switch), or after a new EDID source ie. a new display device has been connected to the router.

| ← | (E_S_C) CrLf |
|---|---|

**Example # 1**: After routing EDID to a selected output.

→ {5:101}
← (E_SW_OK)CrLf
← **(E_S_C) CrLf**

**Example # 2:** After routing EDID to a selected output. Connecting a new display ie. a new LCD display, to one output.

← **(E_S_C) CrLf**

*Info:* *The router stores the last attached display device's EDID connected to the output. After disconnecting this device its EDID is still present in the router's memory, therefore no status change message is issued by the router if a display device having the same EDID is connected to that output. (The same display device is connected again, or another display device (same brand) from the the same manufacturer)*

*Info:* *To keep your application in sync with the router it is recommended to issue a show validity ( {wv} ) → after receiveing EDID status changed response, and read all locations indicating '3' in the table, as the EDID changes triggered the 'EDID status changed' response.*

### 4.4.2. Port Status Changed**

**Description:** If STATUS_TABLE has changed, the router will send this sequence to notify the controller software. This event is useful to trigger the new {:ISD} and {:OSD} commands.

| ← | (PSC)CrLf |
|---|---|

### 4.4.3. Router ready (after power up or restart)

**Description:** The router issues this command after each power up. After this command the router is ready to accept control commands.

| ← | (<router_id>●Ready!) CrLf |
|---|---|

*Note:* *During the booting process (before the ,,Router ready" message) various messages are sent about the selftest results. The format of these messages is: (B:<message>)*
*Your control software should ignore these strings because they are useful only in case of hardware failure.*

| **<router_id>** |
|---|
| „MX32x32DVI FRAME" |
| „MX16x16DVI FRAME" |
| „MX8x8DVI FRAME" |
| „UNKNOWN FRAME" |

* See session: „EDID Management: using EDID Router"
** See session: „Input and output port status"

### 4.4.4. Error responses

**Invalid input number***

**Description:** Given input number exceeds the maximum number of inputs or equals zero. ← (ERR01)CrLf

**Invalid output number***

**Description:** Given output number exceeds the installed number of outputs or equals zero. ← (ERR02)CrLf

**Invalid value**

**Description:** Given value exceeds the maximum allowed value that can be sent. ← (ERR03)CrLf

**Invalid preset number**

**Description:** Given preset number exceeds the maximum allowed preset number. ← (ERR04)CrLf

*Info:* *The maximum preset number is limited to 32 for all routers.*

* The maximum i/o number is assigned to the router frame and is independent from the actual i/o configuration.

# 4.5. Input and output port status

## 4.5.1. Check the status of the inputs

**Description:** Use this command to determine the actual status of the input ports.

| | |
|---|---|
| → | {:ISD} |
| ← | (ISD•STATUS_TABLE)CrLf |

**Example:**

| | | |
|---|---|---|
| **MX32x32** | → | {:ISD} |
| | ← | *(ISD 0011233323330003 3330022000000000)CrLf* |
| **MX16x16** | → | {:ISD} |
| | ← | *(ISD 0011733373330003)CrLf* |
| **MX8x8** | → | {:ISD} |
| | ← | *(ISD 07711303)CrLf* |

**Legend:**

**0** PWR5V signal is not present on this input.

**1** PWR5V signal is present on this input.

**2** Active DVI video signal is present on this input (data enable signal is successfully recovered from the TMDS stream) but there is no PWR5V.

**3** Active DVI video signal is present on this input (Data enable signal is successfully recovered from the TMDS stream) with PWR5V.

**6** The input port operates in HDMI mode but there is no PWR5V.

**7** The input port operates in HDMI mode.

**4, 5, 8** Not used

## 4.5.2. Check the status of the outputs

**Description:** Use this command to determine the actual status of the output ports.

| | |
|---|---|
| → | {:OSD} |
| ← | (OSD•STATUS_TABLE)CrLf |

**Example:**

| | | |
|---|---|---|
| **MX32x32** | → | {:OSD} |
| | ← | *(OSD 0011011100110001 1100011000000000)CrLf* |
| **MX16x16** | → | {:OSD} |
| | ← | *(OSD 0011110111010001)CrLf* |
| **MX8x8** | → | {:OSD} |
| | ← | *(OSD 01011101)CrLf* |

**Legend:**

**0** There is no attached monitor

**1** There is an attached monitor

### 4.5.3. Setting the cable equalization

**Supported cards** MX-DVI-HDCP-IB
MX-HDMI-IB
MX-HDMI-TP-IB

**Description:** You are able to set the cable equalization with this command. Use this feature only if there is no picture or only noisy picture is present. Be careful because too high or too low amplification levels can result in video signal loss or quality decay.

| | |
|---|---|
| → | {:EQ#<in>@SI=a} |
| ← | (EQ#<in>@SI=a)CrLf |

| | |
|---|---|
| → | {:EQ#<in>@AI=a} |
| ← | (EQ#<in>@AI=a)CrLf |

The first version of the command (with @SI) will affect only one input while the second version (@AI) will set the equalization on ALL supported inputs regardless of the value of the <in> field.

You have to specify the equalization in decibels with one digit precision. The decimal point must not be written. Zero value means automatic gain control mode.

**Example:** Set 25dB equalization level on the input port 7:

→ {:EQ#7@SI=250}
← (EQ#7@SI=250)

**Example:** Enable automatic cable equalization on all input:

→ {:EQ#1@AI=0}
← (EQ#1@AI=0)

**Note:** The MX-DVI-HDCP-IB and MX-HDMI-IB cards support at this moment only the next equalization modes: Automatic, 3dB, 9dB, 25dB, 35dB, 40dB. Any other setting will be rejected on these cards and will result in no answer.

### 4.5.4. Get the actual cable equalization value on an input port

You are able to get the actual amplification level with the HDMIIGET command. Please refer to the 4.5.5.5 section.

### 4.5.5. Get detailed information about a HDMI input port

**Supported cards** MX-DVI-HDCP-IB
MX-HDMI-IB
MX-HDMI-TP-IB

**Description:** You can get more detailed information about an input HDMI port with this command. The response will contain information about the general signal parameters, the video resolution and mode, the audio format, other advanced parameters and the actual settings on this port.

| | |
|---|---|
| → | {:HDMIIGET<in>} |
| ← | (STI<in>=Block1;Block2;...;Blockn;)CrLf |

The response repeats the number of the input port after the STI string. There are different blocks present after the equal sign, which are separated by semicolons. Every block contains different type of information and can be recognized about the first character. For example, a block started with 'V' is about the video resolution

and format. Some of the blocks might be missing depending on the actual signal – e.g. if the port operates in DVI mode then no audio information will be sent.

**Example:**

→ {:HDMIIGET12}

← **(STI12=S1110;V1920x1080p50,270,1;A1C010600;I11112;P2C;)CrLf**

The exact meanings of different blocks are explained in the following sections.

#### 4.5.5.1. Signal info block

**Format:** S*abcd*

The signal info block contains some general information about the signal. The first character is 'S'. After that the characters have different meanings:

a: 0 – There is no PWR5V signal on this input
1 – PWR5V signal is present

b: 0 – There is no valid video signal on this input
1 – Active video signal is present (SCDT present)

c: 0 – This port operates in DVI mode
1 – This port operates in HDMI 24 bpp mode
2 – This port operates in HDMI 30 bpp mode (deep color)
3 – This port operates in HDMI 36 bpp mode (deep color)

d: 0 – HDCP encryption is disabled
1 – HDCP encryption is active on this port

**Example:** S1110;

**Legend:** 24bpp HDMI signal is sent without HDCP encryption.

#### 4.5.5.2. Video info block

This block determines the resolution, the refresh rate, the scan mode (progressive or interlaced) and the color space.

The first character of this block is 'V', after that are the horizontal and the vertical resolutions in pixel units separated by an 'x' symbol. The next character is 'p' or 'i' depending on the scan mode.

The next number is the vertical refresh rate in Hz rounded to the nearest integer. The next number is separated by comma and it is the actual frequency of the horizontal sync signal in kHz units.

The next value determines the actual color space; the possible values are shown in the table. Other values are reserved and may be used in the future version of this protocol.

| | **Colorspace** |
|---|---|
| 00 | RGB444 |
| 10 | YUV422 |
| 20 | YUV444 |

**Example:** V1920x1080p50,270,10;

**Legend:** 1920x1080 resolution in progressive mode at 50Hz vertical refresh value, YUV444 color space. The frequency of the horizontal sync is 270kHz.

*Note:* *This block is present only if a valid video signal is available on the selected port.*

#### 4.5.5.3. Audio info block

**Format:** A*abcdeeff*

The audio info block determines the type of the audio, the decoded sampling frequency and some further information extracted from Audio InfoFrames.
The system is able to distinguish three main audio types: LPCM audio, compressed audio and high-bitrate audio. LPCM audio (also called Linear Pulse Code Modulation) can be 2-channel or multichannel with various sample lengths and sampling frequencies. The compressed audio means an IEC61937 compliant stream, which could be for example Dolby Digital, DTS or MLP. The system is not able to distinguish these compressed formats. The High-Bit-Rate (HBR) audio means the new formats that were defined in the HDMI 1.3 specification such as Dolby TrueHD and DTS-HD Master Audio.

The first character shall be 'A', this identifies the type of the block. The following characters have different meanings:

a: '0' - There is no audio data present on this link. The following characters will be missing in the block.
'1' - PCM audio
'2' - Compressed audio
'4' - High-Bit-Rate audio

b: This field determines the sampling frequency decoded by the built-in audio clock regeneration unit. The possible values are:

| | | | |
|---|---|---|---|
| A | 44.1 kHz | J | 768 kHz |
| C | 48 kHz | K | 96 kHz |
| D | 32 kHz | M | 176.4 kHz |
| E | 22.05 kHz | O | 192 kHz |
| G | 24 kHz | B | no information |
| I | 88.2 kHz | | |

c: This hexadecimal number determines the used audio codec. This value is the same as the first four bits in the Audio Infoframes. Please note that most of the DVD and BD players don't specify this field.

The possible values according to the CEA-861 specification:

| | | | |
|---|---|---|---|
| 0 | Undetermined | 7 | DTS |
| 1 | IEC60958PCM | 8 | ATRAC |
| 2 | AC-3 | 9 | One Bit Audio |
| 3 | MPEG1 (Layers 1& 2) | A | Dolby Digital + |
| 4 | MP3 (MPEG1 Layer 3) | B | DTS-HD |
| 5 | MPEG2 (multichannel) | C | MLP |
| 6 | AAC | | |

d: This field determines the channel number extracted from the Audio InfoFrame. Please note that most DVD and BD players don't specify this field unless a PCM signal is sent.

'0' - Channel number is not specified
'0'..'7' - Channel number is equal to *(d+1)*

ee: This is the hexadecimal value of the second byte of the Audio InfoFrame. This field specifies the sampling frequency and sample size reported by the source.
The 7-5 bits of this byte are reserved and shall be zero.
The 4-2 bits determine the sampling frequency:

| | | | |
|---|---|---|---|
| 000 | Unspecified | 100 | 88.2kHz |
| 001 | 32kHz | 101 | 96kHz |
| 010 | 44.1kHz (CD) | 110 | 176.4kHz |
| 011 | 48kHz | 111 | 192kHz |

The 1-0 bits determine the sample length if the format is PCM:

| | |
|---|---|
| 00 | The sample length is not specified by source |
| 01 | 16 bit |
| 10 | 20 bit |
| 11 | 24 bit |

For example '0F' means 48kHz sampling frequency and 24 bit sample length.

ff: This is the hexadecimal value of the fourth byte of the Audio InfoFrame. This byte describes how various speaker locations are allocated to the audio channels. The possible values are shown below.

| **ff** | **Channel number** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **value** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** |
| **00** | | | | | | | FR | FL |
| **01** | | | | | | LFE | FR | FL |
| **02** | | | | | FC | | FR | FL |
| **03** | | | | | FC | LFE | FR | FL |
| **04** | | | | RC | | | FR | FL |
| **05** | | | | RC | | LFE | FR | FL |
| **06** | | | | RC | FC | | FR | FL |
| **07** | | | | RC | FC | LFE | FR | FL |
| **08** | | | RR | RL | | | FR | FL |
| **09** | | | RR | RL | | LFE | FR | FL |
| **0A** | | | RR | RL | FC | | FR | FL |
| **0B** | | | RR | RL | FC | LFE | FR | FL |
| **0C** | | RC | RR | RL | | | FR | FL |
| **0D** | | RC | RR | RL | | LFE | FR | FL |
| **0E** | | RC | RR | RL | FC | | FR | FL |
| **0F** | | RC | RR | RL | FC | LFE | FR | FL |
| **10** | RRC | RLC | RR | RL | | | FR | FL |
| **11** | RRC | RLC | RR | RL | | LFE | FR | FL |
| **12** | RRC | RLC | RR | RL | FC | | FR | FL |
| **13** | RRC | RLC | RR | RL | FC | LFE | FR | FL |
| **14** | FRC | FLC | | | | | FR | FL |
| **15** | FRC | FLC | | | | LFE | FR | FL |
| **16** | FRC | FLC | | | FC | | FR | FL |

| ff value | Channel number | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| 17 | FRC | FLC | | | FC | LFE | FR | FL |
| 18 | FRC | FLC | | RC | | | FR | FL |
| 19 | FRC | FLC | | RC | | LFE | FR | FL |
| 1A | FRC | FLC | | RC | FC | | FR | FL |
| 1B | FRC | FLC | | RC | FC | LFE | FR | FL |
| 1C | FRC | FLC | RR | RL | | | FR | FL |
| 1D | FRC | FLC | RR | RL | | LFE | FR | FL |
| 1E | FRC | FLC | RR | RL | FC | | FR | FL |
| 1F | FRC | FLC | RR | RL | FC | LFE | FR | FL |

**Legend:**

**FR** / **FL** Front Right / Front Left
**LFE** Low-frequency effect
**FC**/**RC** Front Center / Rear Center
**RR**/**RL** Rear Right / Rear Left
**FRC**/**FLC** Front Right Center / Front Left Center
**RRC**/**RLC** Rear Right Center / Rear Left Center

Please note that the values of *c*, *d*, *ee* and *ff* fields are based on the audio InfoFrame sent by the source device while values of *a*, *b* are based on measurements. Of course audio InfoFrames are forwarded in unchanged form to the HDMI sink devices (e.g. A/V Receivers) so that they would be able to interpret the InfoFrames correctly.

**Example:** A1C010600; (two channel 48kHz PCM)

**Note:** This block is present only if an HDMI signal is available on the selected port.

#### 4.5.5.4. Advanced info block

**Format:** I*abcdef*

For advanced users this block provides information which could be useful during debugging process. The first character of this block must be 'I'. The meanings of the following characters are:

a: 0 - VSYNC polarity is negative (leading edge falls)
1 - VSYNC polarity is positive (leading edge rises)

b: 0 - HSYNC polarity is negative (leading edge falls)
1 - HSYNC polarity is positive (leading edge rises)

c: 0 - There is no change on the TMDS clock line
1 - Signal is present on the TMDS clock line

d: 0 - The clock signal is unstable on the TMDS clock line
1 - The clock signal is stable on the TMDS clock line

e: Active Format Aspect Ratio based on AVI InfoFrame

0 Field is not present (e.g. DVI signal)
2 16:9 (top)
3 14:9 (top)
4 greater than 16:9 (centre)
5 Same as picture aspect ratio
9 4:3 (centre)
A 16:9 (centre)
B 14:9 (centre)
D 4:3 (with shoot and protect 14:9 centre)
E 16:9 (with shoot and protect 14:9 centre)
F 16:9 (with shoot and protect 4:3 centre)

f: Pixel repetition factor based on AVI InfoFrame

0 No repetition (i.e. pixel sent once)
1 Pixel sent 2 times (i.e. repeated once)
3 Pixel sent 4 times

**Example:** I111190;
(positive HSYNC and VSYNC, stable pixel clock, 4:3 aspect ratio and no pixel repetition)

#### 4.5.5.5. Input settings block

**Format:** P*ab*;

You are able to verify the actual settings on the selected input ports with this block. This block is always present. The first character is 'P', the next characters are:

a: The cable equalization level at this input. The possible values are:

0 Automatic cable equalization
1 Equalization is 3dB
2 Equalization is 9dB
3 Equalization is 25dB
4 Equalization is 35dB
5 Equalization is 40dB

b: The state of color range compression. The values are the same as described in the 4.5.7 section.

**Example:** PAA;

(Automatic cable equalization and color range conversion is disabled)

### 4.5.6. Get detailed information about a HDMI output port

**Supported cards** MX-DVI-HDCP-OB
MX-HDMI-OB

| | |
|---|---|
| → | {:HDMIOGET<in>} |
| ← | (STO<in>=Block1;Block2;...;Blockn;)CrLf |

**Description:** This command gets more detailed information about an output HDMI port. The response will contain information about the general signal parameters, the video resolution and mode, the audio format, other advanced parameters, the capabilities of the sink device and the actual settings of this port.

The main structure is the same as described at the HDMIIGET command in section 4.5.5. The STO response may have Video Info block, Audio Info block and Advanced Info block with the same syntax as described in sections 4.5.5.2, 4.5.5.3 and 4.5.5.4 but there are also several new block types.

**Example:** → {:HDMIIGET12}

← (**STO8=G11111;V1280x720p60,450,0;A1C05000b;I1111IA;M11011107;OAAAAAU;)CrLf**

The exact meanings of the new blocks are explained in the following sections.

#### 4.5.6.1. General Info Block

**Format**: G*abcde*;

This block provides information about the general status of the selected HDMI output port. The first character is 'G', the following characters have different meanings:

a:
- 0 There is no attached sink device
- 1 Attached sink device is present (termination is present)

b:
- 0 DVI signal is transmitted
- 1 HDMI signal is transmitted (no deep color)
- 2 30 bits/pixel deep color HDMI signal is transmitted
- 3 36 bits/pixel deep color HDMI signal is transmitted

c:
- 0 No valid signal is routed to this port
- 1 Valid video signal is present

d:
- 0 HDCP encryption is currently disabled on this port
- 1 HDCP encryption is active

e:
- 0 Hotplug detect signal is low
- 1 Hotplug detect signal is high

#### 4.5.6.2. Sink device Info Block

**Format:** M*abcdefggh*;

This block provides some general information about the attached sink device based on the EDID and the HDCP cypher engine. Please note that you are able to get much more detailed information by downloading the full EDID structure with the ,,we" command.

The first character of this block is 'M', the meanings of the following fields are described below.

a: 0 Sink device doesn't support HDMI
1 Sink device is HDMI compatible

b: 0 HDCP authentication failed
1 HDCP authentication is successful

c: 0 Sink device is not an HDCP repeater
1 Sink device is an HDCP repeater

d: 0 Sink device doesn't support YUV444 color space
1 Sink device supports YUV444 color space

e: 0 Sink device doesn't support YUV422 color space
1 Sink device supports YUV422 color space

f: 0 Sink device has no audio capabilities
1 Sink device has audio capabilities

gg: This field represents a byte in hexadecimal format.
The meanings of the bits are:

data bit 0 - Sink device supports 32kHz PCM audio
data bit 1 - Sink device supports 44kHz PCM audio
data bit 2 - Sink device supports 48kHz PCM audio
data bit 3 - Sink device supports 88kHz PCM audio
data bit 4 - Sink device supports 96kHz PCM audio
data bit 5 - Sink device supports 176kHz PCM audio
data bit 6 - Sink device supports 192kHz PCM audio
data bit 7 - Reserved (Always 0 in this version of protocol)

h: One digit number, the meanings of the bits are:

data bit 2 - HDMI deep color 30bits/pixel mode is supported
data bit 1 - HDMI deep color 36bits/pixel mode is supported
data bit 0 - YUV444 color space is supported in DC modes

*Info:* *Field c value is accurate only if the field b is equal to '1'.*

**Example:** M110111077;

**Legend:** HDMI and HDCP capable device, not HDCP repeater, it supports all color spaces and 32kHz, 44kHz and 48kHz PCM audio. All deep color modes are supported. Additional audio formats may be stored in the EDID.

#### 4.5.6.3. Output settings block

**Format:** O*abcdef*

This block contains information about the actual settings of the selected HDMI output port. The first character of the block is 'O', the meanings of the *a*,*b*,*c*,*d*,*e* fields are the same as the parameters of HDMIOSET command described in section 4.5.8.

**Example:** OAACA1;

### 4.5.7. Set color range conversion at a HDMI input port

**Supported cards** MX-DVI-HDCP-IB
MX-HDMI-IB
MX-HDMI-TP-IB

**Description:** You are able to control the color range conversion with this command on the input ports. There are three options: leave the color range unchanged, compress or expand.
The first version of the command (@SI) will affect only one port while the second (@AI) makes changes on all inputs. However the <in> field has no significance in that case, it must be valid.

| | |
|---|---|
| → | {:HDMISET#<in>@SI=a} |
| ← | (STI<in>=Block1;Block2;...; Blockn;)CrLf |

| | |
|---|---|
| → | {:HDMISET#<in>@AI=a} |
| ← | (STI<in>=Block1;Block2;...; Blockn;)CrLf |

The possible values of the field *a* are:

A - No color range conversion
C - Compress the color range (0-255 → 16-235)
E - Expand the color range (16-235 → 0-255)

After the successful execution the system is going to respond with an STI response with an included Input settings info block – so you are able to verify the new settings.

**Example:** →{:HDMISET#6@SI=E}
←(STI6=S0000;PAE;) CrLf

### 4.5.8. Set HDMI output port parameters

**Description:** HDMI output cards have various settings, which can be set with this command. Every setting has an automatic mode (this is the default) when the system selects the proper conversions based on the type of the video signal and the capabilities of the sink device, but you are also able to force other conversions with this command.

| | |
|---|---|
| → | {:HDMISET#<out>@SO=a;b;c;d;e;} |
| ← | (STO<out>=Block1;Block2;...; Blockn;)CrLf |

| | |
|---|---|
| → | {:HDMISET#<out>@AO=a;b;c;d;e;} |
| ← | (STO<out>=Block1;Block2;...; Blockn;)CrLf |

If you send the first version of the command (with @SO) then the new settings will affect only the <out> output port. The @AO version will affect all HDMI output ports regardless of the value of the <out> field.

The possible values of the fields are:

a:
- A The HDMI/DVI mode selection is automatic.
- D Always send DVI signal
- H Force 24bits/pixel HDMI signal
- 1 Force 30bits/pixel HDMI deep color signal
- 2 Force 36bits/pixel HDMI deep color signal
- x Don't modify this setting

b:
- A Automatic color space selection
- 1 Force RGB
- 2 Force YUV444
- 3 Force YUV422
- x Don't modify this setting

c:
- A Handle color range conversion automatically
- C Compress the incoming color range to 16-235
- E Expand the incoming color range to full scale
- x Don't modify this setting

d:
- A Automatic PCM subsampling
- D Disable PCM subsampling
- 2 2x PCM subsampling (it only affects 2ch PCM signals!)
- 4 4x PCM subsampling (it only affects 2ch PCM signals!)
- x Don't modify this setting

e:
- A Handle HDCP automatically
- 1 Always use HDCP
- x Don't modify this setting

After the successful execution the system is going to respond with an STO response with an included Output settings info block – so you are able to verify the new settings.

**Example:** Force YUV444 24 bits/pixel HDMI signal on output port 4:

→ {:HDMISET#4@SO=H;2;x;x;x;}
← (STO4=G1100;OH2AAA;) CrLf

**Example:** Reset all settings to the factory defaults on output port 2:

→ {:HDMISET#2@AO=A;A;A;A;A;}
← (STO3=G1100;OAAAAA;) CrLf

**Example:** Reset the color space conversion to the default values on all output ports:

→ {:HDMISET#7@AO=x;A;x;x;x;}
← (STO7=G1100;OAAAAA;) CrLf

### 4.5.9. Reset HDCP cache

| | |
|---|---|
| → | {:HDCPRESET} |
| ← | (OK)CrLf |

**Description:** The matrix stores the so-called KSV identifiers of the last sixteen attached sinks and reports them to all HDCP sources. This method eliminates the need of reauthentication on every switching but it also has some side effects: if a source device doesn't support 16 sinks at the same time, then it won't work even after removing some display devices.
By performing an HDCP reset you have the possibility of overcoming this problem. The command will cause a short blinking period on all HDCP signals.

**Example:** → {:HDCPRESET}
← (OK) CrLf

### 4.5.10. Measure timing parameters

| | |
|---|---|
| → | {:TIMINGS<in>} |
| ← | (TIMINGS<in>=*[hexadecimal data bytes]*)CrLf |

**Description:** The system continuously measures the parameters of the incoming signals such as pixel clock frequency, horizontal and vertical back porch, front porch etc. You are able to read this information from the matrix with this command. This could be useful only for advanced debugging processes. To get the active video resolution and common video parameters please use the HDMIIGET command as explained in chapter 4.5.5.

This section assumes that you are familiar with the DVI standard and the computer science.

The {:TIMINGS<*in*>} command will request the detailed timings information on the input port <*in*>. The port number shall not be padded with zeros.
The answer repeats the command and consists of 15 data bytes. Every data byte is represented as a two-digit hexadecimal number. The meanings of these data bytes are:

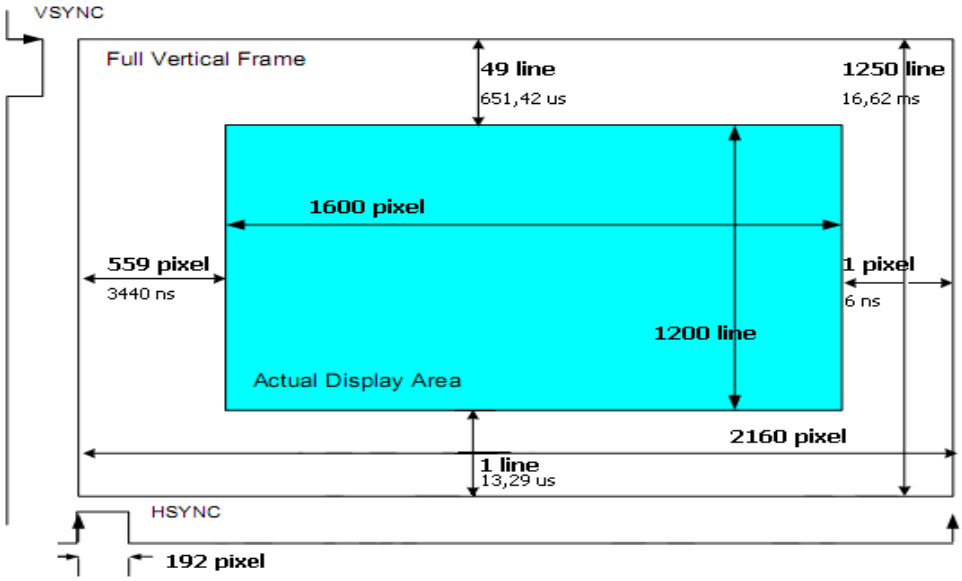
| data bytes | Description |
|---|---|
| 1 | Measured interval between two HSYNC active edges. The unit of the value is unique pixels. MSB byte is first. |
| 2 | |
| 3 | Measured interval between two VSYNC active edges. The unit of the value is lines. MSB byte is first. |
| 4 | |
| 5 | Defines the width of the active display area. The unit of the value is unique pixels. MSB byte is first. |
| 6 | |
| 7 | Defines the height of the active display area. The unit of the value is unique pixels. MSB byte is first. |
| 8 | |
| 9 | VSYNC to active video lines. This is equal to vertical sync width plus vertical back porch. The unit of the value is lines. |
| 10 | Vertical sync front porch time measured in lines. |
| 11 | Reserved for future use |
| 12 | Width of the HSYNC pulse in units of unique pixels. LSB byte is first. |
| 13 | |
| 14 | V value. This number is used to determine the actual pixel clock frequency. MSB byte is first. |
| 15 | |

Use the following formula to calculate the actual pixel clock frequency:

$$f_{pixelclock} = 58003{,}46 / V$$

**Example:** → {:TIMINGS8}
←(:TIMINGS8=087004e2064004b031010100c00165) CrLf

The explanation of this answer:




The pixel clock is 162,4 Mhz.

*Note:* *Pixel clock is not equal to TMDS clock in deep color modes. To calculate the TMDS clock you have to determine the number of bits per pixel (bpp) by running an HDMIIGET command. The TMDS clock is equal to pixel clock multiplied by bpp/24*
*If you want to evaluate the data rate or the needed bandwidth, you have to calculate with TMDS clock.*

# 5. Software control –Using Lightware Matrix Controller

## 5.1. Establishing the connection

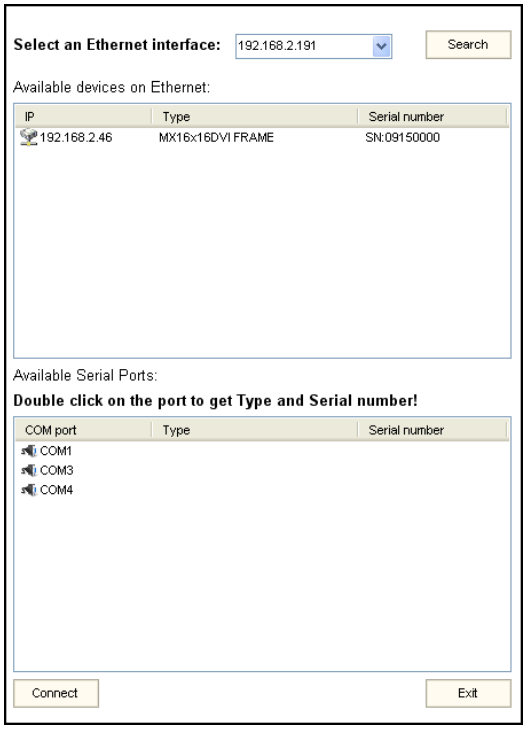
The unit can be controlled using Lightware Matrix Controller software from a PC or Laptop via RS-232 connection or Ethernet port.

**Step 1.** Connection between the Matrix and the computer can be made via
- serial port, with standard RS-232 Male to Female cable
- Ethernet (with a HUB or to a simple endpoint)
- Ethernet directly (with cross UTP cable)

**Step 2.** Starting the application

To run the CONTROL SOFTWARE double click on the icon of the software on the desktop or select proper shortcut from Start Menu/Programs/Lightware folder.

**Step 3.** Select communication interface according to your actual connection:




If the PC has more Ethernet cards installed, you can select the desired card to query the LAN for Lightware devices.

If the connection has been made via ethernet select the desired IP address in the window. No IP addresses will be shown if no LAN enabled Lightware matrix switcher is connected to the same network that the PC is connected to.

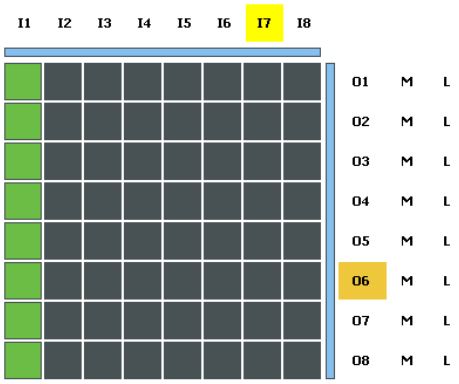
If the connection has been made via serial port, select the appropriate communication port. To query the selected COM port for the device Type and Serial Number double click on then desired COM port.

*Info:* *After starting the Lightware Matrix Controller, it automatically searches for Lightware devices connected to the LAN. If it finds any, it picks its IP address, Type and Serial Number and lists the devices. If there is not any matrix switcher connected to the ethernet network, only serial ports will be shown in this menu.*

*Info:* *Only one user is allowed to connect to the matrix switcher via ethernet.*

*Info:* *Be sure that the firewall is not blocking the application!*

Click on the Connect button to connect to the device. When the Lightware Matrix Controller finds the hardware, it determines the product type, and a button matrix area appears according to the input and output numbers of the router. I1; I2; I3...columns represent the inputs, the O1; O2; O3...rows represent the outputs. Each green square represents a valid connection.




## 5.2. Control menu

This menu contains the crosspoint area and the preset area. After connecting to a new device, this menu appears by default.

### 5.2.1. Switch, mute and lock

For making a connection click on the desired square. If the output port is not locked or muted, the connection will be made. Please note that if an HDCP encrypted signal is switched to a non-HDCP sink then a blank red picture will be sent.

For switching an input to all outputs, click with the left mouse button on the input label, and click "Switch to all outputs" from the popup menu.

Outputs can be easily muted by clicking on the button titled 'M' beside the output. This means that no signal is present at this output.

Outputs can be locked to any input. After locking an input to an output, no switching is permitted to this output unless it is unlocked again.

*Info:* *Loading a preset doesn't alter either the lock state or the switch state of a locked output. If an output is locked to an input before preset loading it will also be locked to that input after preset loading, so locked outputs ignore the preset.*

### 5.2.2. Input and output states

Each input and output label has a colored background according to its state, so the user can see the main information with a quick look at them.

**Legend for input labels:**

No source is connected. The power +5V is not present.

Source is connected, but there is no active video signal.

DVI signal is present on the link.

HDMI signal is present on the link.

**Legend for output labels:**

There is no device connected or the connected device is turned off.

Hotplug is present, a sink is connected.

Staying with the cursor above a label shows a hint about these states.

### 5.2.3. Card types

With Lightware Hybrid Technology the matrix frames can be equipped with different types of cards. The colored bars near the crosspoint area display the type of the card in each slot. Whether it is an optical, a twisted pair or other kind of card, a different color represents it's type.

**Legend for card types:**

Unknown card or empty slot.

MX-DVID card

MX-DVI-TP card

MX-HDMI or MX-DVI-HDCP card

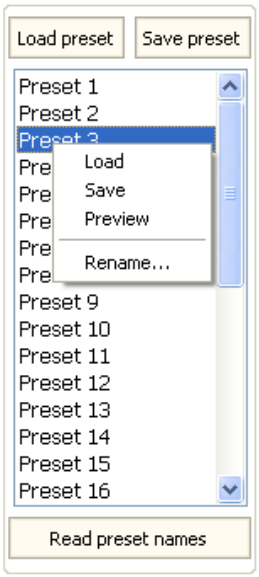
MX-DVI-DL card

MX-OPT-DVI card

### 5.2.4. PRESET operations

Preset operations can be done on the right PRESET panel. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved at any time.

*Info:* *A preset setting stores a full configuration of all outputs, so presets have an effect on every output, when loading a Preset.*




**Load preset**

**Step 1.** Select the preset memory (Preset1...Preset32) you want to load as the next configuration.

**Step 2.** Press LOAD PRESET button or right click on Load in the popup menu. Now the preset is loaded.

**Step 3.** The new I/O configuration is displayed on the matrix switching area.

**Save preset**

**Step 1.** Make the desired configuration on the matrix switching area.

**Step 2.** Select the preset memory (Preset1...Preset32) where you want to save your current configuration.

**Step 3.** Press SAVE PRESET button or right click on the preset and click Save in the popup menu. Now the preset is stored.

**Rename preset**

**Step 1.** Select the preset memory (Preset1...Preset32) you want to rename.

**Step 2.** Right click RENAME... in the popup menu. The Rename window appears.

**Step 3.**Type in the desired name and click APPLY. Now the new preset name is stored.

*Info:* *If the CPU firmware version is above 2.0.0 then the preset names are stored in the matrix memory and they can be loaded in another PC. Otherwise, the preset names are stored locally in a file on the current PC.*

**Read preset names**

Click on the READ PRESET NAMES button in the preset area to download them from the device. The control software doesn't download the names automatically, if you want see the names stored in the matrix, you have to click this button manually.

## 5.3. EDID menu

### 5.3.1. EDID Router operation

By clicking on the **EDID** menu, the EDID router window appears.

When the user enters the menu for the first time, the software starts to download the whole EDID list from the matrix. It may take about 30-40 seconds.

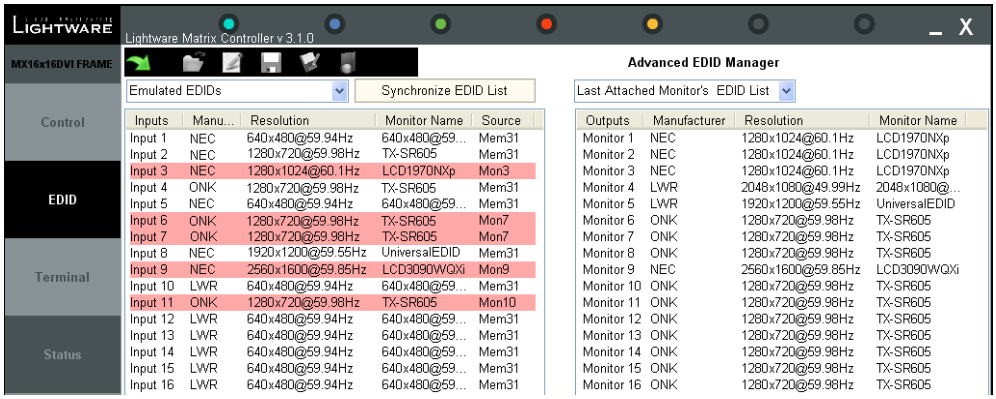
After the list is downloaded, the current status of the EDID list is shown in two windows. In the combo box you can select which part of the EDID memory to be seen in which window.

The **Emulated EDID List** window contains the resolution, manufacturer and vendor name of the EDID reported to the sources for each input separately. The source column displays the memory location that the current EDID was routed from. The rows with red background are dynamically routed to the input.

The **Last attached Monitor's EDID List** window contains the resolution, manufacturer and vendor name of the display devices connected to matrix switcher's output.

The **Factory EDID List** window shows the factory memory locations with preprogrammed EDID.

The **User EDID List** shows the memory locations which can be used by the user to save EDID.


LIGHTWARE
Lightware Matrix Controller v 3.1.0
MX16x16DVI FRAME
Control
EDID
Terminal
Status
Advanced EDID Manager
Emulated EDIDs
Synchronize EDID List
Last Attached Monitor's EDID List
Inputs Manu... Resolution Monitor Name Source
Input 1 NEC 640x480@59.94Hz 640x480@59... Mem31
Input 2 NEC 1280x720@59.98Hz TX-SR605 Mem31
Input 3 NEC 1280x1024@60.1Hz LCD1970NXp Mon3
Input 4 ONK 1280x720@59.98Hz TX-SR605 Mem31
Input 5 NEC 640x480@59.94Hz 640x480@59... Mem31
Input 6 ONK 1280x720@59.98Hz TX-SR605 Mon7
Input 7 ONK 1280x720@59.98Hz TX-SR605 Mon7
Input 8 NEC 1920x1200@59.55Hz UniversalEDID Mem31
Input 9 NEC 2560x1600@59.85Hz LCD3090WQXi Mon9
Input 10 LWR 640x480@59.94Hz 640x480@59... Mem31
Input 11 ONK 1280x720@59.98Hz TX-SR605 Mon10
Input 12 LWR 640x480@59.94Hz 640x480@59... Mem31
Input 13 LWR 640x480@59.94Hz 640x480@59... Mem31
Input 14 LWR 640x480@59.94Hz 640x480@59... Mem31
Input 15 LWR 640x480@59.94Hz 640x480@59... Mem31
Input 16 LWR 640x480@59.94Hz 640x480@59... Mem31
Outputs Manufacturer Resolution Monitor Name
Monitor 1 NEC 1280x1024@60.1Hz LCD1970NXp
Monitor 2 NEC 1280x1024@60.1Hz LCD1970NXp
Monitor 3 NEC 1280x1024@60.1Hz LCD1970NXp
Monitor 4 LWR 2048x1080@49.99Hz 2048x1080@...
Monitor 5 LWR 1920x1200@59.55Hz UniversalEDID
Monitor 6 ONK 1280x720@59.98Hz TX-SR605
Monitor 7 ONK 1280x720@59.98Hz TX-SR605
Monitor 8 ONK 1280x720@59.98Hz TX-SR605
Monitor 9 NEC 2560x1600@59.85Hz LCD3090WQXi
Monitor 10 ONK 1280x720@59.98Hz TX-SR605
Monitor 11 ONK 1280x720@59.98Hz TX-SR605
Monitor 12 ONK 1280x720@59.98Hz TX-SR605
Monitor 13 ONK 1280x720@59.98Hz TX-SR605
Monitor 14 ONK 1280x720@59.98Hz TX-SR605
Monitor 15 ONK 1280x720@59.98Hz TX-SR605
Monitor 16 ONK 1280x720@59.98Hz TX-SR605

**Change emulated EDID at one or all inputs**

All EDID are enumerated in the left and the right lists too. The two main types of the emulation are the static and the dynamic:

- Static EDID emulation happens, when an EDID from memories 1..100 is selected and emulated at the input(s)

- Dynamic EDID emulation occurs, when an attached monitor's EDID is emulated at input(s), simply copying the data from the monitor. This EDID changes automatically, if a new monitor is attached to the output.

**Step 1.** Select the Emulated EDID List in one of the list window areas in the drop-down menu.

**Step 2.** Select the desired EDID from one of the list windows (from #1..100 through Input1..to Output32)

**Step 3.** Drag and drop the EDID to the desired location.

To change the emulated EDID on all inputs at the same time, right click on the desired new EDID and select "Switch to all Inputs" from the pop-up menu.

*Info:* *If a monitor's EDID was selected to be emulated (Output 1 to 8) the currently emulated EDID will be changed on that(those) input(s) every time a new monitor is connected. If the monitor is disconnected from the output, the latest EDID remains, it will not be deleted from the input. This feature helps especially rental technicians or system integrators to keep the source continuously transmitting the signal, and adopt the system for new incoming display devices.*

*Info:* *Power ON/OFF cycle will not affect the emulated EDID or other settings.*

*Info:* *EDID switch procedure causes a status change and hence it is reported back to the CONTROL SOFTWARE within 2-3 seconds.*

**Learn EDID from attached display device**

The system is able to learn the EDID from the connected display device and store it in one of the user programmable memory locations.

**Step 1.** Select the User Memory in one of the list window areas in the drop-down menu.

**Step 2.** Select the EDID to be saved from the other list window.

**Step 3.** Drag and drop the selected EDID to the desired User Memory location.

**Load EDID from file to memory**

The system is able to learn and store EDID from a file located on the computer. EDID are stored in *.dat files.

**Step 1.** Select the User Memory list window from one of the combo boxes, and right click on the desired memory location. Then select "Load from file" from the pop-up menu.

**Step 2.** Browse your hard drive to find the wanted EDID file in the pop-up window. The software checks whether the selected file is a valid EDID file.

**Step 3.** Click Open in the browser window. After the process finished, "EDID Upload completed" message appears.

**Save EDID from memory to file**

The control software is able to download EDID from the MATRIX SWITCHER and to save it as an EDID file.

**Step 1.** Right click on the EDID to be saved.

**Step 2.** Click on the "Save to file" in the pop-up window.

**Step 3.** The Matrix Controller Software downloads the desired EDID and a save dialog appears. It may take a few seconds to download the EDID. If the save dialog is shown, type in the file name, and press Save button. After the process was completed, an "EDID saved!" message confirms the command.

**Synchronize EDID**

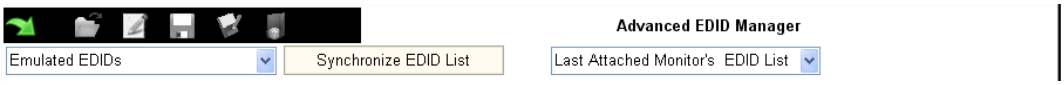
By clicking "Synchronize EDID List" button the Lightware Matrix Controller software rereads all EDID information from the connected MATRIX SWITCHER. During normal operation it is not necessary to use this menu function because the matrix switcher always reports every status change automatically.

*Info:* *There is always a small delay in responses. So if a new monitor is connected to the output its new EDID is not shown immediately but in 2-3 seconds!*

*Info:* *As the matrix switcher reports status change nothing will happen if you select the same EDID to a given input or connect the same display device to a given output!*

### 5.3.2. Advanced EDID Manager

The Lightware Advanced EDID Manager is integrated into the Lightware Matrix Controller software. By clicking on the green arrow, the editor area rolls down.



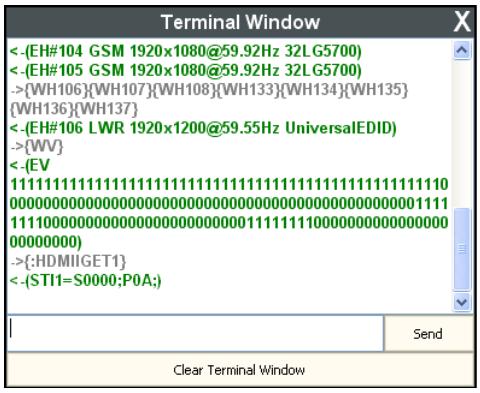

When the user enters the menu first, an empty EDID is loaded into the editor's memory.

All EDID in the matrix memory can be edited in the following way:

**Step 1.** Right click on the desired EDID to be loaded to the EDID Manager.

**Step 2.** In the pop-up menu, click on "Edit EDID" The editor area automatically rolls down, and the EDID is loaded into the editor area.

## 5.4. Terminal menu

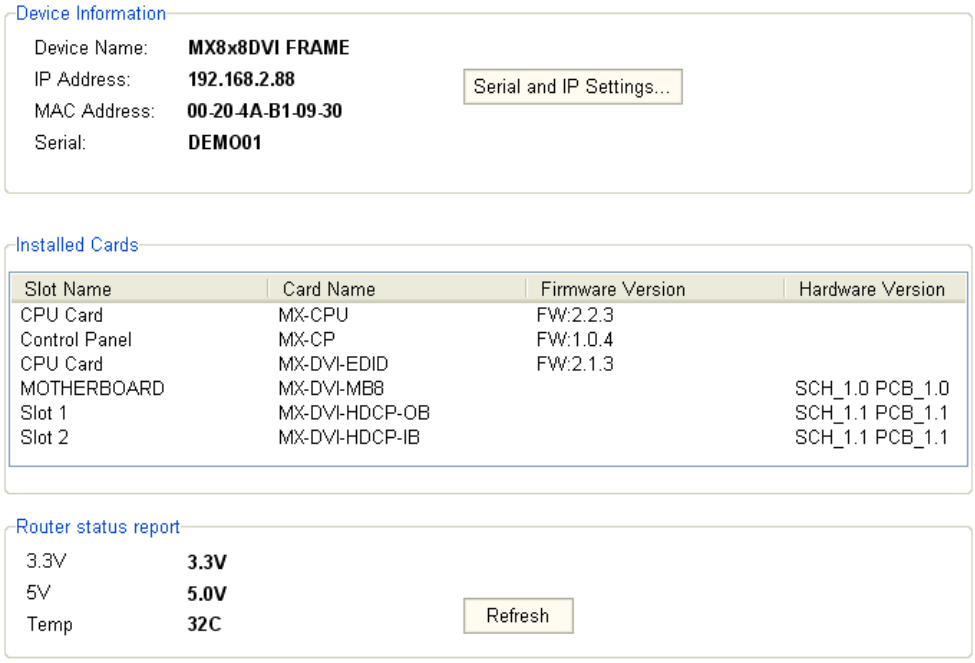



This general-purpose serial terminal is intended mainly for test and debug purposes. After a successful connection to a router this terminal can be used either via serial or TCP/IP connection. All commands can be used here that were discussed in the Programmer's reference section. The text can be typed directly.

By default commands are surrounded by framing brackets. Every sent command and every received response gets an arrow (-> or <-) prefix, and has different font colors in order to help distinguishing.

## 5.5. STATUS menu

Basic device information, the installed cards' firmware, hardware revisions and the router's health are displayed in this window.


Device Information
Device Name: MX8x8DVI FRAME
IP Address: 192.168.2.88
MAC Address: 00-20-4A-B1-09-30
Serial: DEMO01
Serial and IP Settings...
Installed Cards
Slot Name | Card Name | Firmware Version | Hardware Version
CPU Card | MX-CPU | FW:2.2.3
Control Panel | MX-CP | FW:1.0.4
CPU Card | MX-DVI-EDID | FW:2.1.3
MOTHERBOARD | MX-DVI-MB8 | SCH_1.0 PCB_1.0
Slot 1 | MX-DVI-HDCP-OB | SCH_1.1 PCB_1.1
Slot 2 | MX-DVI-HDCP-IB | SCH_1.1 PCB_1.1
Router status report
3.3V 3.3V
5V 5.0V
Temp 32C
Refresh

*Info:* *If the device is connected via RS-232, the IP and MAC address fields show that it is a serial connection.*

If the matrix is connected via IP connection, the serial and IP settings can be viewed by clicking on the "Serial and IP Settings..." button. Now the window containing the configuration appears.

### 5.5.1. IP configuration

**Obtain IP address automatically**

By selecting the "Obtain IP address automatically" option, the matrix gets the IP address from the DHCP server on the LAN, or if DHCP server is not present, it gets an AutoIP address from the 169.254.xxx.xxx domain.

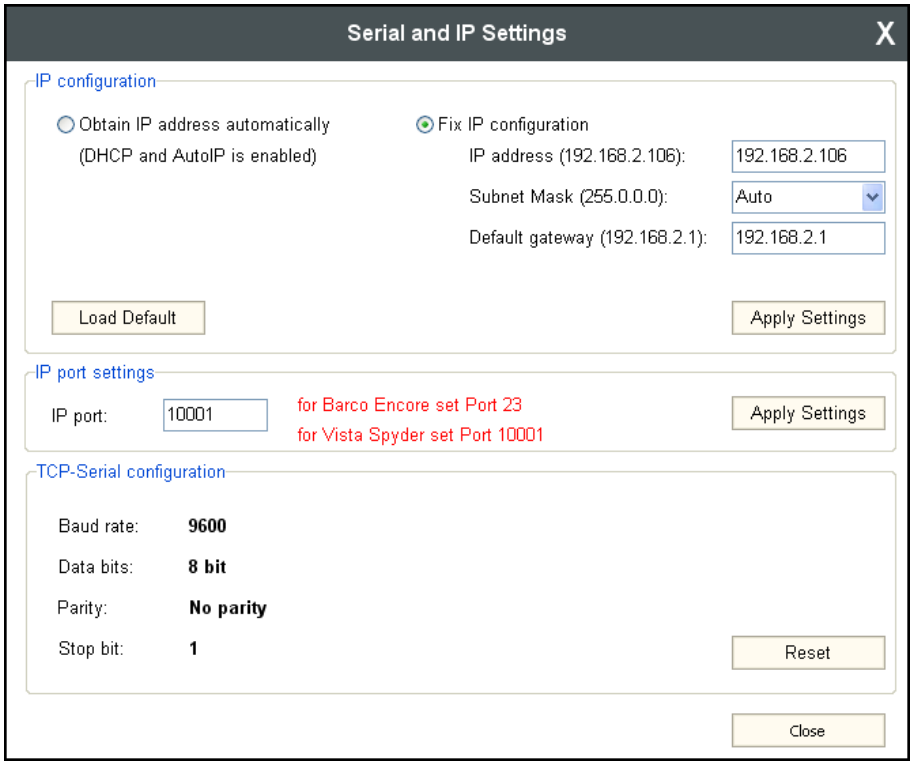
**Fix IP configuration**

In this case, the matrix has an IP address configuration set up by the user/administrator.

**Step1:** Select the "Fix IP configuration" option.

**Step 2:** Type in the IP address, select the desired subnet mask and type in the gateway IP address. The current configuration is in brackets.

**Step 3:** Click on "Apply Settings" button. Depending on the modified settings, you might need to restart the Matrix Switcher and the Matrix Controller Software.




*Info:* *The "Load Default" button loads the factory default IP settings to the fields, which contain a fix configuration:*

*IP Address:* *192.168.254.254*
*Subnet Mask:* *255.255.0.0*
*Default Gateway:* *0.0.0.0*

### IP port settings

The router can be accessed via this TCP/IP port number with TCP connection. This number can be modified to any number between 1025-65535 except the followings: 9999, 14000-14009,30704,30718.

The port 23 is accepted for Barco Encore. To use the matrix with the Vista Spyder set port to 10001.

*Info:* *The IP port number is 10001 by default.*

### TCP-serial configuration

For informational purposes, the properties of the TCP-serial interface are displayed. This is a communication interface from the embedded Ethernet device towards the main CPU.

The "Reset" button resets these values to the factory default, and has a safety purpose only.

In the normal operation there is no need to reset these values. The above picture shows the factory default values in normal operation.

## 5.6. Find menu

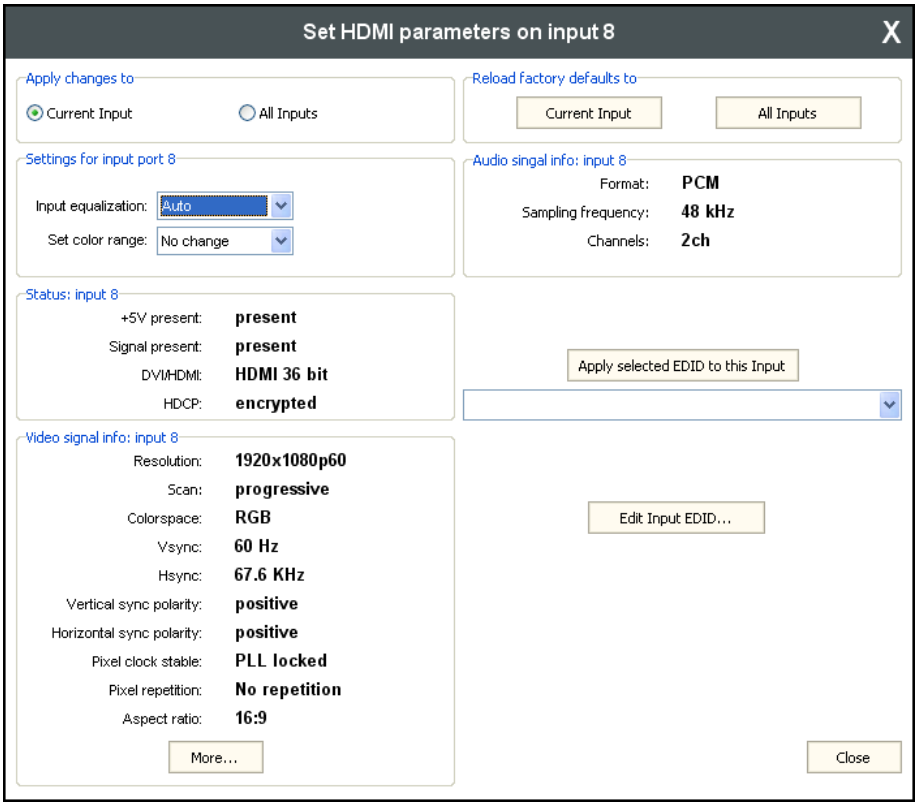
By clicking this menu, the available devices can be rescanned on the serial port and on the Ethernet, as mentioned in the application starting phase. If the Matrix Controller Software has a live connection to a device on a port, a question window appears, asking if you really want to disconnect.

## 5.7. Input and output Settings

If the MATRIX SWITCHER has one or more input or output cards installed, that have properties available for the user/system administrator to change, than the settings window can be reached by right clicking on the input or output label. The exact look of the setting windows may depend on the type of the card because the different cards have different capabilities. The pictures below are about MX-DVI-HDCP and MX-HDMI input and output cards.

### 5.7.1. Set HDMI parameters on input

A right click on input port label near the crosspoint field will result in opening the HDMI setting window if the card is HDMI capable.




**Apply changes to**

**Current input:** this option means the modified parameters are applied only to the currently selected port.

**All inputs:** this option means that the modified parameters are applied to all input ports.

*Info:* *After closing this window, the Current Input option will be selected regardless of which was active at the time of closing. It is to avoid setting All Inputs by mistake.*

**Reload factory defaults**

**Current input:** Loads the factory default values to the currently selected input.

**All inputs:** Loads the factory default values to all inputs.

**Settings for input port**

I**nput equalization:** Each input port has a built-in equalizer, which is able to compensate the attenuation of DVI and HDMI cables for up to 60 meters at 1080p60 resolution. These equalizers work in automatic gain control mode by default and in most cases this operates with adequate result. Sometimes – especially with very long cables – the equalization level has to be set manually.

**Set color range:** With this setting you are able to control the color range conversion on the input ports. There are three options: leave the color range unchanged, apply compression (0-255 ➔ 16-235) or expansion (16-235 ➔ 0-255).

**Status**

| | |
|---|---|
| **+5V present** | Shows if there is a source device connected to the port. |
| **Signal present** | Shows if there is valid video signal on this input. |
| **DVI/HDMI** | Shows the current mode and color depth. |
| **HDCP** | Shows if the encryption is active or not. |

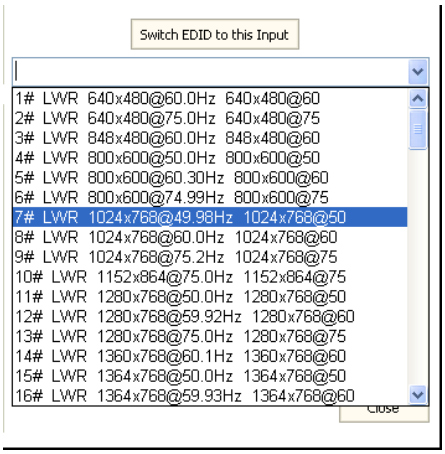
**Video signal info**

| | |
|---|---|
| **Resolution** | Horizontal and vertical resolution, scan mode and the refresh rate of the signal. |
| **Scan** | Scan mode (interlaced or progressive). |
| **Color space** | Shows the actual color space of the video signal (RGB, YUV 4:4:4, YUV4:2:2). |
| **Vsync** | Vertical refresh rate. |
| **Hsync** | Frequency of the horizontal sync. |
| **Vsync polarity** | The polarity of the vertical sync. It can be negative (leading edge falls) or positive (leading edge rises). |
| **Hsync polarity:** | The polarity of the horizontal sync. Polarity can be negative (leading edge falls) or positive (leading edge rises) |
| **Pixel clock stable:** | Shows whether the clock signal is stable on TMDS line. |
| **Pixel repetition:** | Pixel repetition factor (1x, 2x, 4x). |
| **Aspect ratio:** | Active Format Aspect Ratio based on AVI InfoFrame |

**Audio signal info**

| | |
|---|---|
| **Format** | Shows the type of the audio. |
| **Sampling frequency** | Shows the sampling frequency determined by the built-in audio clock regeneration unit. |
| **Channels:** | Shows the channel number as extracted from the Audio InfoFrame (0 to 7). |

### EDID switching




A selected EDID can be switched to the currently selected input directly from the input settings window.

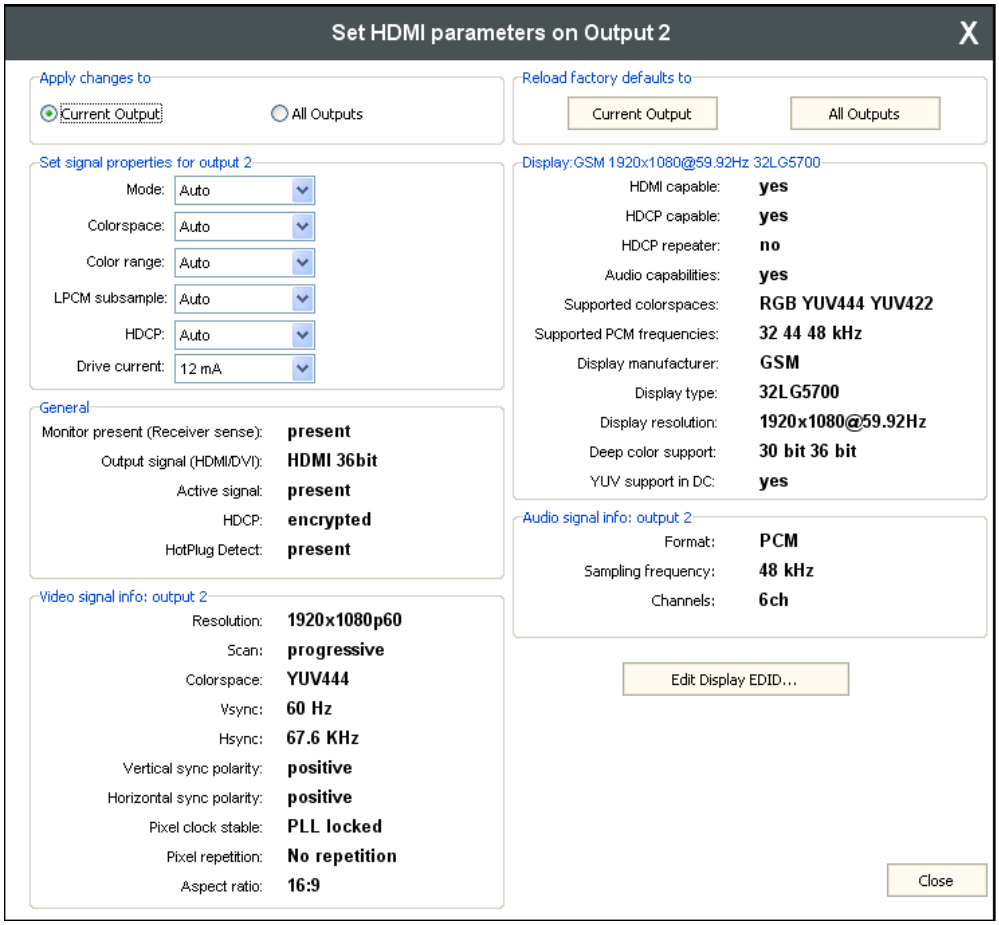
**Step1:** Go to the EDID menu, and query the EDID list if it has not been downloaded from the matrix switcher yet. (A notifying text can be seen in this case) Now the switching from the settings window is available.

**Step 2:** Select the desired EDID from the drop-down list.

**Step 3:** Click on "Switch EDID to this Input" button. Now the matrix switches the EDID, and the software refreshes the list.

## 5.7.2. Set HDMI parameters on output

A right click on input port label near the crosspoint field will result in opening the HDMI parameter setting window if the card is HDMI capable.




### Apply changes to

**Current output:** this option means the modified parameters are applied only to the currently selected port.

**All outputs:** this option means that the modified parameters are applied to all output ports.

*Info:* *After closing this window, the Current Output option will be selected regardless of which was active at the time of closing. It is to avoid setting All Outputs by mistake.*

**Reload factory defaults**

**Current output:** Reloads the default values to the currently selected output.

**All outputs**: Loads the factory default values to all outputs.

**Set signal properties for output**

| | |
|---|---|
| **Mode** | It specifies the desired type of outputted signal on the port (Auto, DVI, HDMI 24-bit, HDMI 30-bit or HDMI 36-bit).<br>If you select Auto, the system will configure the mode automatically based on the capabilities of your display and the incoming signal. |
| **Color space** | Convert the color space on the output to the given type. You are able to force any-to-any color space conversion or leave this field on Auto. Please note that DVI signals support only RGB color space. |
| **Color range** | Defines color range conversion for the output port. |
| **LPCM subsample** | Defines the subsampling of the PCM audio signal. This setting applies only to the 2-channel PCM audio. The minimum of the new sampling frequency is 44.1kHz. |
| **HDCP** | Determines HDCP encryption for the output signal. In automatic mode the encryption depends on the incoming signal. You are also able to force HDCP on non protected signals. Removing the encryption from a content protected video is not possible due to the limitations of the specification. |
| **Drive current** | It specifies the drive current of the internal crosspoint circuit. It is strongly recommended to leave this value at the default 12mA. |

**General**

| | |
|---|---|
| **Monitor present** | Shows if there is a sink device attached. |
| **Output signal** | Actual type and color depth of the transmitted signal over this port. |
| **Active signal** | Shows if there is a valid signal routed to this output port. |
| **HDCP** | Shows if the HDCP encryption is currently enabled or disabled. |
| **HotPlug Detect** | Shows if the sink device is ready to receive the signal. |

**Display**

| | |
|---|---|
| **HDMI capable** | Shows whether the sink supports HDMI. |
| **HDCP capable** | Shows if the HDCP authentication was successful or failed. |
| **HDCP repeater** | Shows if the sink device is an HDCP repeater or not. |

| | |
|---|---|
| **Audio capabilities** | Shows if the sink device is able to receive audio. |
| **Supported color spaces** | The supported color spaces by the sink device. |
| **PCM frequencies** | List of the supported PCM audio sample rates. |
| **Display manufacturer** | If there is a sink device attached, this field shows the abbreviation of the device's manufacturer, as defined in the device's EDID. |
| **Display type** | If there is a sink device attached, this field shows the device name given by the vendor, as defined in the device's EDID. |
| **Display resolution** | If there is a sink device attached, this field shows the resolution of the device, as defined in the device's EDID. |
| **Deep color support** | Shows whether the display supports the 30bpp and 36bpp deep color modes or not. |
| **YUV support in DC** | If the display supports any deep color modes, this field shows whether YUV 4:4:4 color space is supported while using deep color formats or not. |

The video signal info and audio signal info has the same fields as described in section 5.7.1.

# 6. Using the WEB interface

## 6.1. Accessing the router's web page

Lightware matrices have a built-in web page, which can be accessed over TCP/IP protocol and offers you full control over all settings even if you don't have the opportunity to install new programs. The router web is compatible with most widely spread browsers and requires no additional software components such as ActiveX controls. The web interface functionality has been tested and confirmed with the following browsers:

**Mozilla Firefox 2 and 3 (recommended)**

**Internet Explorer 6, 7 and 8**

**Opera 8 and 9**

**Safari 3**

**Google Chrome 2.0**

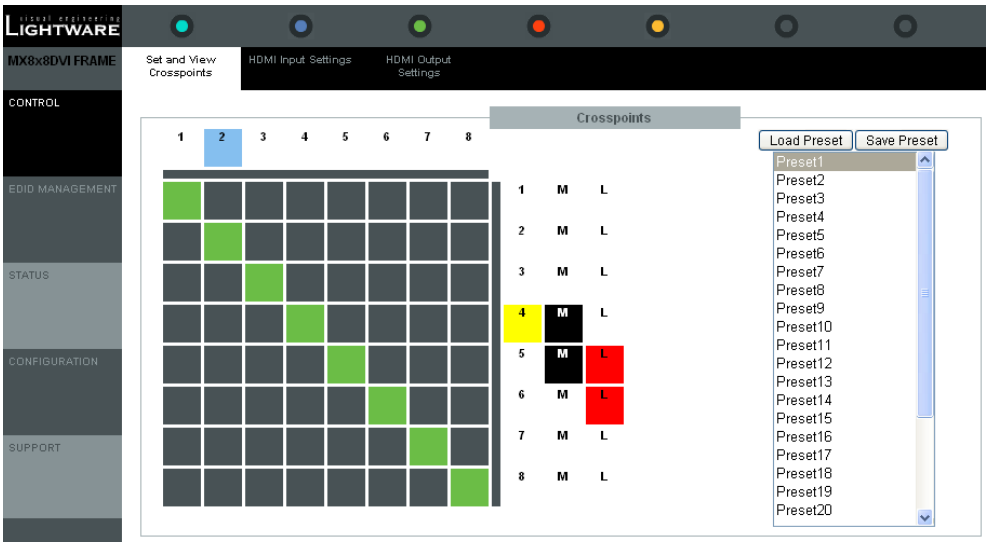
*Note:* *The web page is not compliant with Google Chrome 1.0.*

To access the webpage just run your preferred web browser and type the IP address of the router as URL.

*Note:* *Only one opened web page is allowed simultaneously. Other TCP/IP connections are prohibited while the web page is opened. Using more instances of the web page simultaneously will result in inadequate operations.*

## 6.2. Manage crosspoints and presets

After starting the web page, the crosspoints screen appears by default according to the input and output numbers of the router. Columns represent the inputs while the rows are the outputs. Each green square represents a valid connection. New connections can be made by clicking on the desired gray square.




The labels of the inputs and outputs are colored depending on the port status. The legend is the same as described in section 5.2.2 on page 70.

**Mute**

To mute or unmute an output, just click on the M label in the proper row. The muted port will be marked with black background as shown in the picture above. This means that no signal is present at this output.

*Info:* *Switching is permitted during mute.*

**Lock**

Outputs can be locked to any input. After locking an input to an output, no switching is permitted to this output unless it is unlocked again.

*Info:* *Loading a preset does not change either the lock state or the switch state of a locked output. If an output is locked to an input before preset loading, it will also be locked to that input after preset loading, so locked outputs ignore the preset.*

Click on the proper L label to lock or unlock an output. If an output is locked then it is marked with red and can't be switched or muted before unlocking in order to prevent accidental actions.

**Preset operations**

Preset operations can be done in the right panel of the **Control->Set and View Cross-points** page. Each Lightware matrix switcher has 32 preset memories that can be loaded and saved at any time.

Front panel Preset operations effect only the first 8 preset memories, all others from 9 to 32 are available only via Matrix Controller software and Web Manager.

**Save Preset**

| | |
|---|---|
| **Step 1** | Make the desired configuration on matrix switching area. |
| **Step 2** | Select the preset memory location (Preset1...Preset32) where you want to save your configuration. |
| **Step 3** | Press Save Preset button. A message box appears stating that the preset is now stored. |

**Load Preset**

| | |
|---|---|
| **Step 1** | Select the preset memory location (Preset1...Preset32) you want to load as next configuration. |
| **Step 2** | Press Load Preset button. The preset is now loaded. |
| **Step 3** | The new I/O configuration is displayed in the matrix switching area. |

## 6.3. HDMI settings

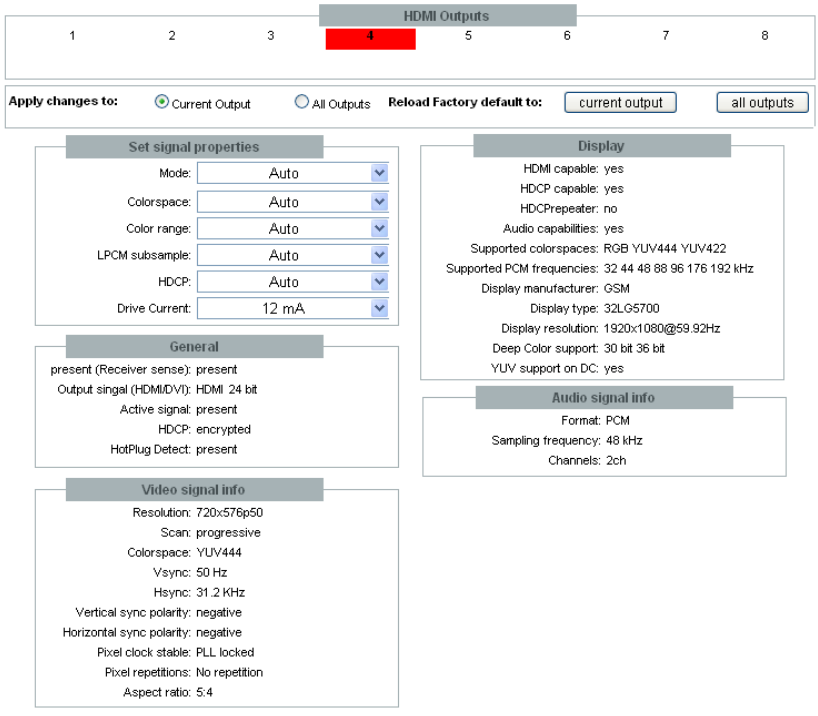
When control menu is selected on the left side, HDMI Input and HDMI Output settings submenus can be selected on the top of the page. These pages allow you check the incoming and outgoing signal parameters and control the settings of the ports independently.

The picture above shows the HDMI input settings. You are able to check and set the same parameters here that are described in detail in section 5.7.1. The settings can be applied to all inputs or to the selected input. The selection can be made on the top; the selected input is marked red. You also have the opportunity to reload the factory default settings to one or to all inputs.

If you made any changes in the “Settings” box, the new settings will have an effect immediately.

By selecting HDMI Output settings, another screen appears (shown below). All parameters can be accessed here that are described in section 5.7.2 including the general port status, video and audio signal info and the capabilities of the attached display device.

New settings and factory defaults can be applied either to all outputs or to one output just like the input settings. The detailed description of each output setting can be found on page 80.



# 6.4. EDID Router operation

By clicking on the **EDID Management** menu, the EDID router page appears.

When the user enters the menu for the first time, the Web Manager starts to download the whole EDID list from the matrix. It may take 2 minutes.

After the list is downloaded, the current status of the MATRIX SWITCHER EDID is shown in the three textboxes.

The **Emulated EDIDs** window contains the resolutions and the vendor names of the EDID reported to the PC for each input separately. The **Last attached Monitor's EDIDs** window contains the resolutions and vendor names of the display devices connected to matrix switcher's output.

## 6.4.1. Change emulated EDID at one or all inputs

All EDIDs are enumerated in the **EDID list** window.

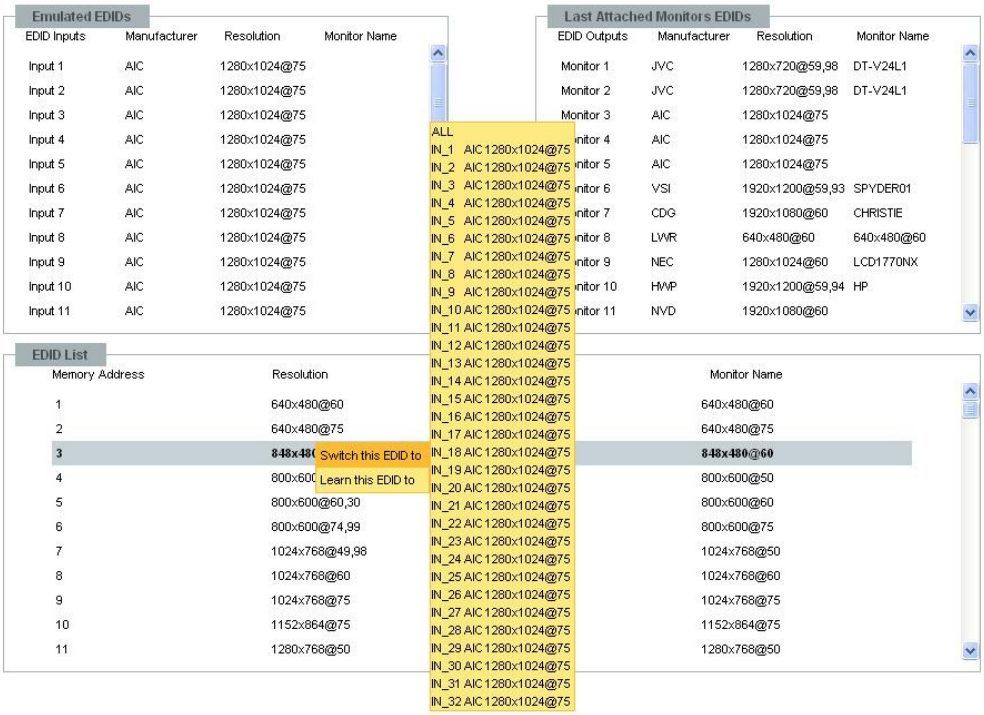
**Step 1** Select the desired EDID from this list with a left mouse click, a pop-up menu appears.

**Step 2** Right click on the Switch this EDID to item. A pop-up menu appears with an input name list.

**Step 3** Right click on the desired input, or on the ALL text. Now the EDID has been changed on selected input as the message box shows in the left corner.

*Info:* *Switching to ALL inputs may take several seconds.*

*Info:* *The user can switch and learn EDIDs in the **Last Attached Monitors EDIDs** window.*



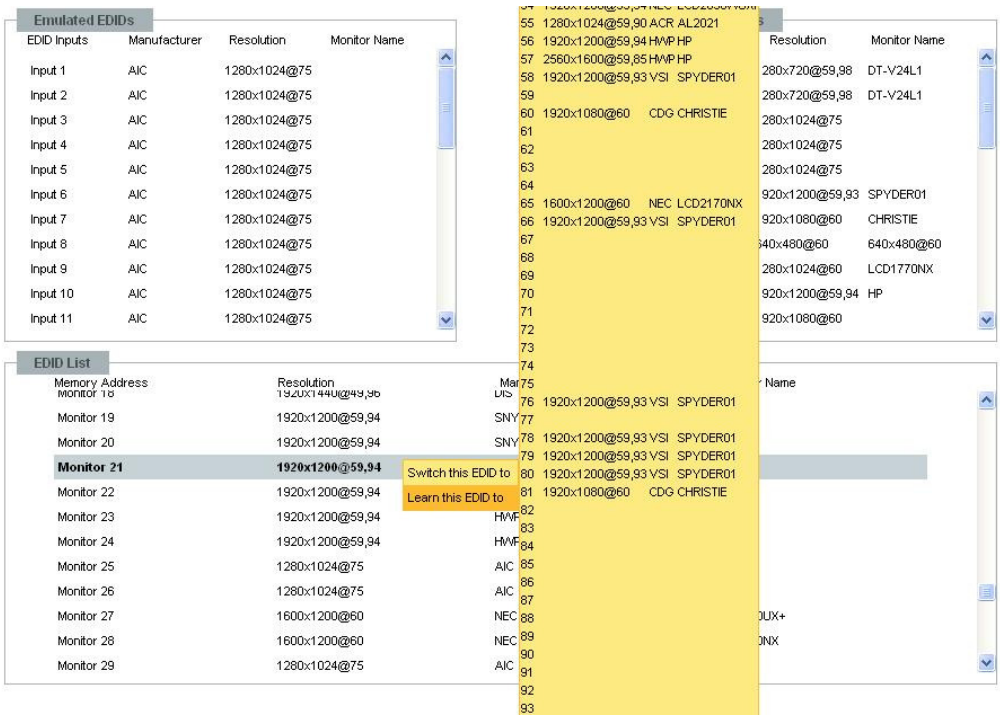
### 6.4.2. Learn EDID from attached display device

The matrix switcher can learn the EDID from the connected display device and can store it in one of the user programmable memoriy locations. Every monitor's EDID is listed in the **EDID list** window, and in the **Last Attached Monitors EDIDs** window.

**Step 1** Right click on the desired monitor's EDID from the list.

**Step 2** Right click on the Learn this EDID to submenu item. A pop-up window will show the memory locations from 50 to 100, which are available for the user.

**Step 3** Right click on the desired memory location. The Web Manager refreshes the lists in a few seconds, and a massage box indicates the change.




## 6.5. Status

Installed cards, the router's health, firmware and hardware versions are displayed in this page.

With the **Refresh** button, the user can update the temperature, voltage, and fan values.

*Note:* *FAN values are not accessible in the MX8X8 frame.*

## 6.6. Network Configuration

The unit's network values are displayed when you select **Configuration->Network Settings**.

The following sections describe the configurable parameters on the Network Settings page.

*Info:* *Most of these settings are also available from the front panel. See page 34 for more details.*

### 6.6.1. Assign IP address automatically

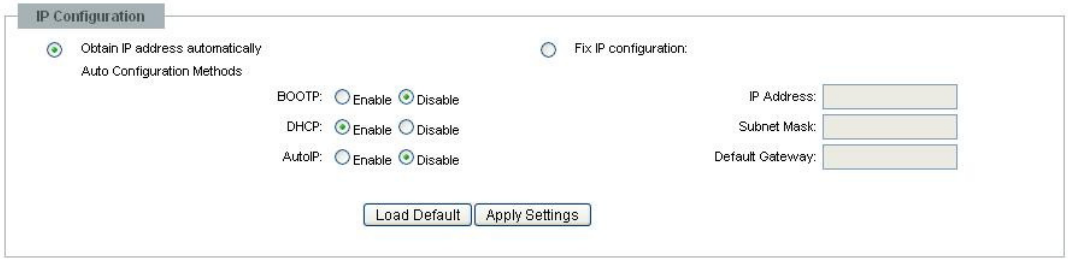
The matrix switcher supports three of the most commonly used automatic IP configuration protocols.

**Step 1** Click on Configuration menu

**Step 2** Select Network Settings

**Step 3** Select Obtain IP address automatically

**Step 4** Enter the following (as necessary):




**BOOTP** Select **Enable** to permit the Bootstrap Protocol (BOOTP) server to assign the IP address from a pool of addresses automatically.

**DHCP** Select **Enable** to permit the Dynamic Host Configuration Protocol (DHCP) server to assign leased IP address to the matrix unit automatically.

**AutoIP** Select **Enable** to permit the matrix to generate an IP in the 169.254.x.x address range with Class B subnet.

*Info:* *Disabling BOOTP, DHCP, and AutoIP (all three checkboxes) is not advised as the only available IP assignment method will then be ARP or serial port.*

When you are finished, click **Apply Settings** button

*Info:* *To continue using the Web Manager, you must type the new IP address in the browser.*

### 6.6.2. Static IP address configuration

The user can manually assign an IP address to the unit, and enter related network settings.

To assign an IP address manually:

**Step 1** Click on Configuration menu

**Step 2** Select Network Settings

**Step 3** Select Fix IP Configuration

**Step 4** Enter the following (as necessary):

| | |
|---|---|
| **IP Address** | If DHCP is not used to assign IP addresses, enter it manually in decimal-dot notation. The IP addresses must be set to a unique value in the network. |
| **Subnet Mask** | A subnet mask defines the number of bits taken from the IP address that are assigned for the host part. |
| **Default Gateway** | The gateway address, or router, allows communication to another LAN segments. The gateway address should be the IP address of the router connected to the same LAN segment as the matrix. The gateway address must be within the local network. |

When you are finished, click **Apply Settings** button

*Info:* *To continue using the Web Manager, you must type the new IP address in the browser.*

### 6.6.3. Loading the default IP settings

**Step 1** Click on the Load Default button. Now the factory default IP address, Subnet Mask and Gateway address is loaded into the input boxes. However, they are not saved.

**Step 2** To save the settings, click on Apply Settings button.

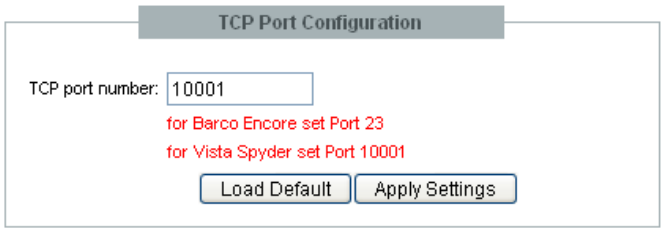
### 6.6.4. TCP Port Configuration

The user can configure the TCP port number, which is used to communicate with the matrix router through LAN. The input box initially contains the current setting.

**Step 1** Type the desired TCP port number into the input box

**Step 2** Press the Apply Settings button. The new port will be active after the next connection.

### 6.6.5. Loading the default TCP Port settings




**Step 1** Click on Load Default button. Now the factory default value is in the input box, but it is not saved.

**Step 2** To save, click on Apply Settings button. The new port will be active after the next connection.

## 6.7. Support

For technical support, please don't hesitate to contact Lightware Visual Engineering at support@lightware.hu.

# 7. Advanced EDID Management

Each DVI and HDMI sink (e.g. monitors, projectors, plasma displays, and switcher inputs) must support the EDID data structure. Source BIOS and operating systems are likely to query the sink using DDC2B protocol to determine what pixel formats and interface is supported. DVI standard makes use of EDID data structure for the identification of the monitor type and capabilities. Most DVI and HDMI sources (VGA cards, set top boxes, etc) will output video signal only after accepting the connected sink's EDID information. In case of EDID readout failure or missing EDID the source will output no signal.

## 7.1. Why is EDID management necessary?

All DVI and HDMI sources must read attached sink's EDID data (switcher input, monitor input, etc.) before starting the video signal transmission. If no EDID is available, most sources will not output the signal. Unlike in standard analog VGA graphics cards, DVI graphics cards do not allow to be forced from Windows desktop/properties/settings tab to different pixel resolutions. Only those resolutions and refresh rates are allowed, which are defined in EDID data.

To provide proper EDID data for the sources, Lightware matrices have an Advanced EDID Manager, which can manage the emulated EDID on all of its inputs independently. The EDID management can be done from the front panel, from the control software, from the webpage or from any other software, which implements the protocol described in the Programmer's reference. Emulating the right EDID information helps the user and installation engineer to control overall system signal properties

EDID emulating options are:

**Memory EDID emulation:** static EDID emulation from factory preset memory (50 EDID from 01 to 50). The selected EDID is emulated at the desired (or all) inputs.

**User memory EDID emulation:** static EDID emulation from user preset memory (50 memory locations from 51 to 100) The selected EDID is emulated at the desired (or all) inputs.

**Dynamic EDID emulation:** copying and emulating EDID from one of attached display devices. The EDID of the attached display device (projector, monitor, etc) is emulated on the desired input. If the display is changed, and new device is attached, the EDID on selected inputs will automatically be changed according to the new display.

With EDID Router function, the user is able to store EDID from any attached monitor to one of the user programmable memories, to download EDID from file to user memory, and to upload EDID from the router to file.

*Info:* *The user does not have to disconnect DVI cables to change an EDID opposite to other manufacturer's products. EDID can be changed even if source is connected to the input and powered ON.*

*Info:* *When EDID has been changed, the router toggles the HOTPUG signal for 200 msec. Some graphic cards or DVD players do not sense the hotplug signal, and it may happen, that even if EDID has been changed, the newly set resolution is not applied. In this case the source device must be restarted or powered OFF and ON again.*

## 7.2. About Advanced EDID Management

The EDID router contains a 164-block non-volatile memory bank. EDID List is structured as follows:

| | |
|---|---|
| **1..50** | Factory Preset EDID list |
| **51..100** | User programmable memories |
| **101..132 (OUT_1...32)** | Last attached monitor's EDID list |
| **133..164 (IN_1...32)** | Emulated EDID at input connectors |

All EDID (including factory preset; user programmable memories; EDID at other inputs; and EDID at outputs) can be switched and emulated at any of the inputs

*Info:* *The first 50 EDID (1…50 inclusive) are factory preprogrammed and cannot be modified. These are the most commonly used resolutions.*

*Info:* *Lightware matrices can handle both 128 Byte EDID and 256 Byte extended EDID structures.*

*Info:* *The attached monitor's EDID is stored automatically, until a new monitor is attached to that particular output. In case of powering off the unit, the last attached monitor's EDID remains in the non-volatile memory.*

| MEMORY | Resolution | | MEMORY | Resolution |
|---|---|---|---|---|
| 01 | 640x480@60 Hz | | 26 | 1600x1200@50 Hz |
| 02 | 640x480@75 Hz | | 27 | 1600x1200@60 Hz |
| 03 | 848x480@60 Hz | | 28 | 1920x1200@60 Hz |
| 04 | 800x600@50 Hz | | 29 | 1920x1200@50 Hz |
| 05 | 800x600@60 Hz | | 30 | 480i@60 Hz |
| 06 | 800x600@75 Hz | | 31 | 640x480@59.94 Hz |
| 07 | 1024x768@50 Hz | | 32 | 720x480p@60 Hz |
| 08 | 1024x768@60 Hz | | 33 | 576i@50 Hz |
| 09 | 1024x768@75 Hz | | 34 | 720x576p@50 Hz |
| 10 | 1152x864@75 Hz | | 35 | 1280x720p@50 Hz |
| 11 | 1280x768@50 Hz | | 36 | 1280x720p@60 Hz |
| 12 | 1280x768@60 Hz | | 37 | 1920x1080i1@50 Hz |
| 13 | 1280x768@75 Hz | | 38 | 1920x1080i2@50 Hz |
| 14 | 1360x768@60 Hz | | 39 | 1920x1080i@60 Hz |
| 15 | 1364x768@50 Hz | | 40 | 1920x1080p@24 Hz |
| 16 | 1364x768@60 Hz | | 41 | 1920x1080p@25 Hz |
| 17 | 1364x768@75 Hz | | 42 | 1920x1080p@30 Hz |
| 18 | 1280x1024@50 Hz | | 43 | 1920x1080p1@50 Hz |
| 19 | 1280x1024@60 Hz | | 44 | 1920x1080p2@50 Hz |
| 20 | 1280x1024@75 Hz | | 45 | 1920x1080p@60 Hz |
| 21 | 1366x1024@60 Hz | | 46 | 2048x1080p1@50 Hz |
| 22 | 1400x1050@50 Hz | | 47 | 2048x1080p2@50 Hz |
| 23 | 1400x1050@60 Hz | | 48 | 2048x1080p@60 Hz |
| 24 | 1400x1050@75 Hz | | 49 | Universal EDID |
| 25 | 1680x1050@60 Hz | | 50 | 2560x1600p@60 Hz |

*Info:* *All factory EDID contains CEA extension which states that the device is HDMI compliant and supports deep color modes. This allows the sources to send HDMI signal if they are capable of it. The matrix is able to convert HDMI signals back to DVI on the output ports if you have DVI capable display devices.*

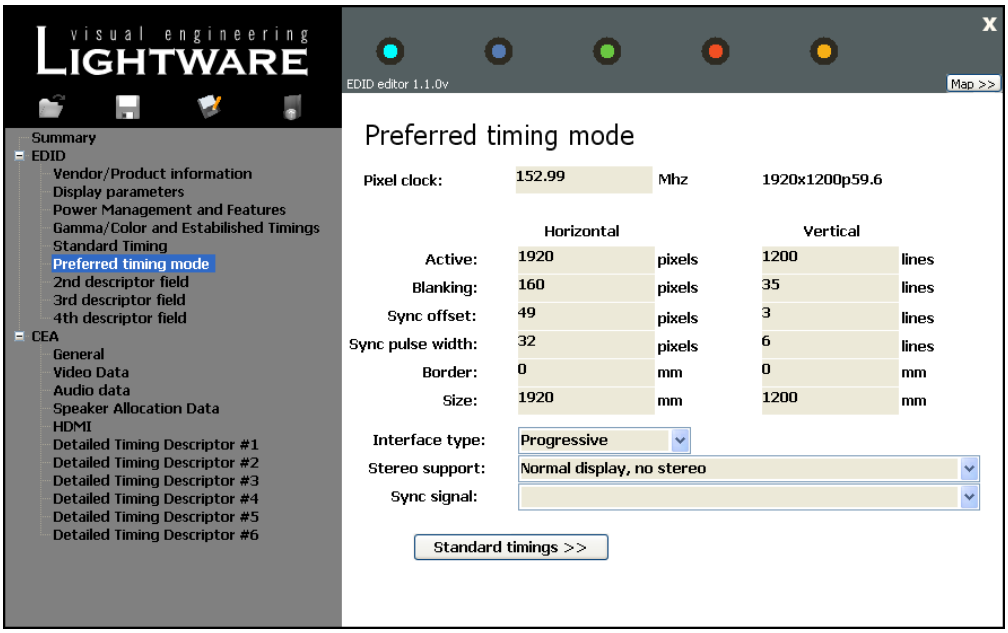
The factory EDID 49 has an exceptional role: the so-called Universal EDID stores as many resolutions and capabilities as possible. If you want to get the best available quality (i.e. highest supported resolution and audio) then it is a good shot to emulate Universal EDID to the inputs. The matrix emulates also this EDID as factory default.

Please note that in order to get the highest available quality, all factory EDID states compatibility with all audio formats. If your display or A/V receiver is not capable of accepting some compressed audio formats that your source supports, then a factory EDID will result in no audible sound.

## 7.3. About the Advanced EDID Manager

The Lightware Control Software has a built-in EDID editor component, which is accessible from both the input and output settings window. This program allows you to create, modify and save unique EDID with any content you want. The modified data can be uploaded to the router memory or saved to file.

EDID is a complex standard so numerous settings can be done here.




DVI sources usually select their resolution based on the preferred timing mode. HDMI devices use short video descriptors if they are available. Short video descriptors can be edited by clicking Video Data in the left menu. Available audio formats can be set on the audio data page.

*Note:* *Most set-top-boxes and blu-ray players have audio settings menu that can override the EDID information. Please refer to the manual of your device for further details.*

# 8. FIRMWARE UPGRADE

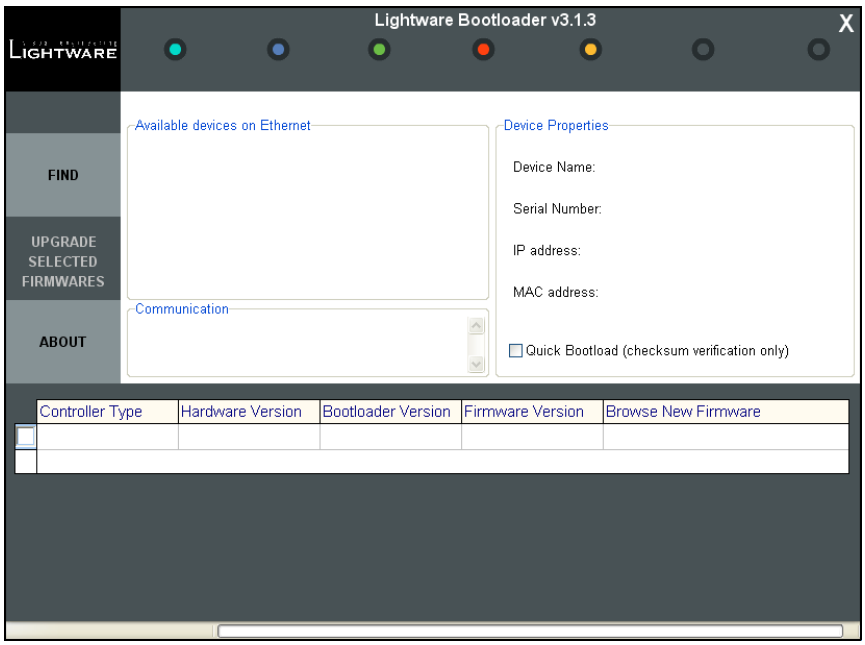
**Using Lightware bootloader application to upgrade router's firmware**

The matrix router can only be updated via LAN, so connect the matrix router to the local subnet. The router is DHCP enabled so it will get an IP address automatically, or if you do not have DHCP server, it will get an AUTO IP address from the AUTO IP domain.

Run "Installer_LW_bootloader.exe"

Run the application from

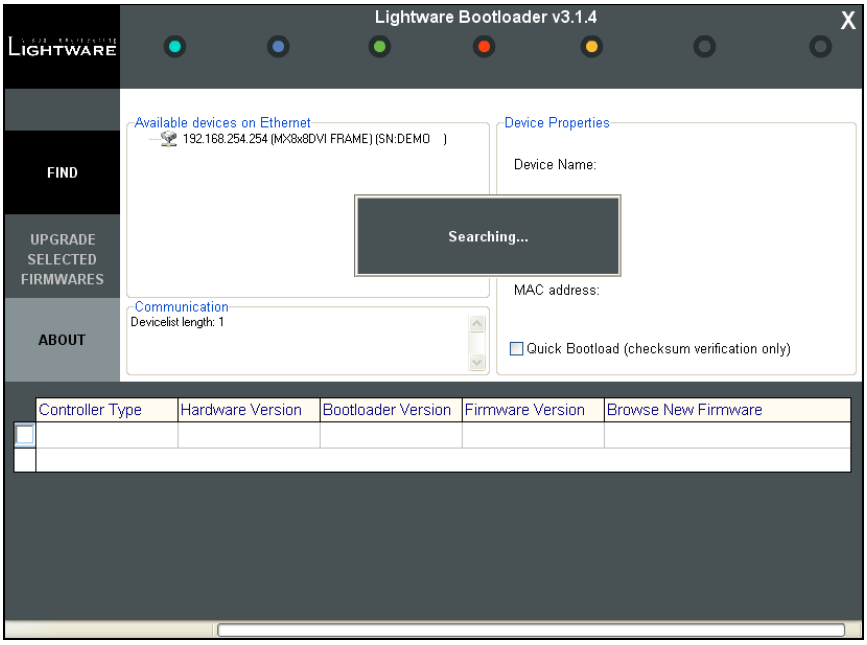
Start Menu->Programs->Lightware- >LW_bootloader->LW_bootloader

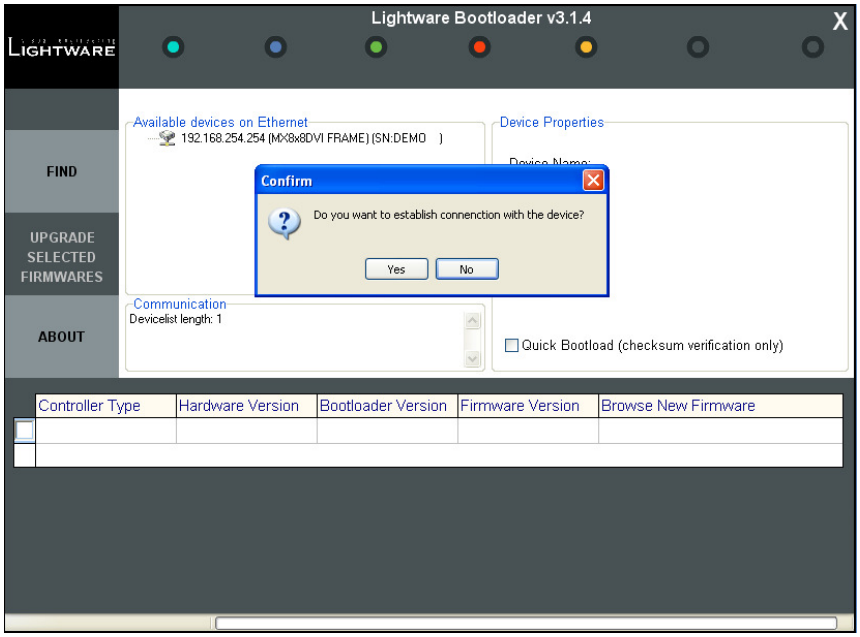



Click "*FIND*" Button. If the bootloader finds one or more routers their IP addresses will be listed in the tree view window. In the tree view, device type and serial number are shown after the IP address. Double click on the IP address, then click "YES" to establish connection with the matrix router. It will take 10-15 seconds to get all information from the router.

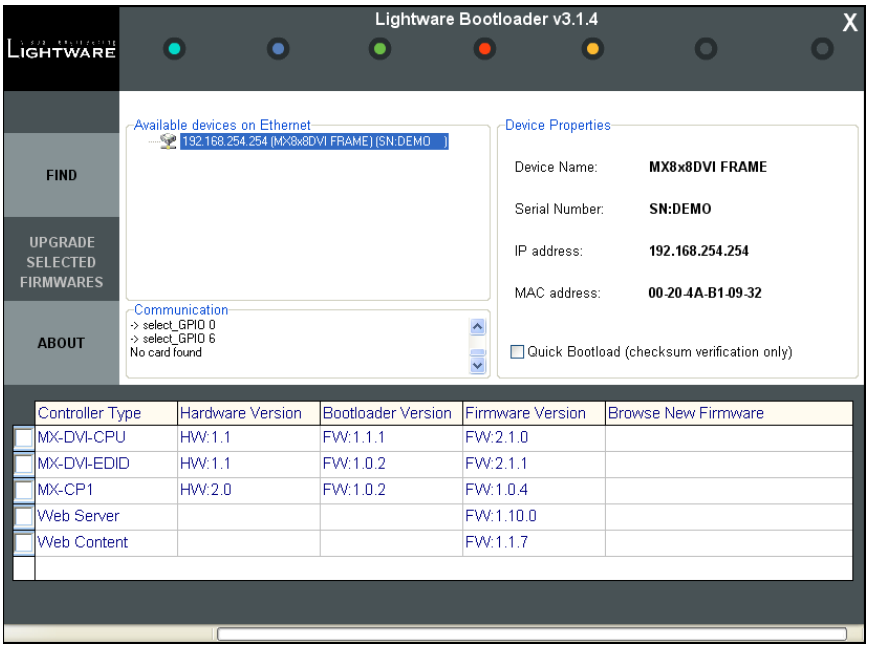
*Info:* *Note, that you must wait until all the devices on the network start up completely, before pressing FIND button.*

*The bootloader application will reset the router during the firmware upgrade.*



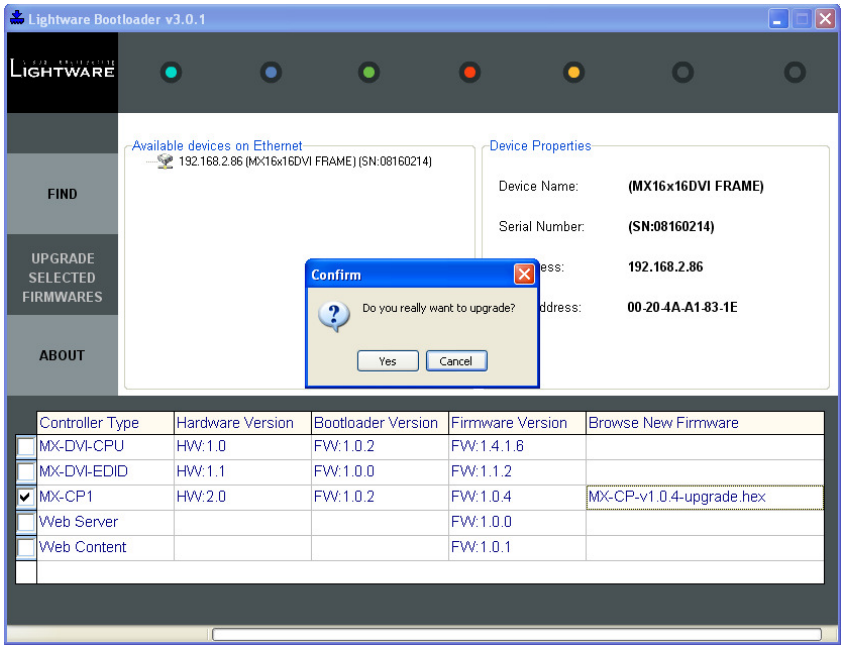

Select the controller(s) that need(s) new firmware by clicking the checkbox next to it. An open file dialog will pop up if you click on the last cell of the appropriate row. Now you can browse for the new firmware file to upload. After opening the new file, the new firmware field will contain the name of the firmware file.


Lightware Bootloader v3.1.4
LIGHTWARE
FIND
UPGRADE SELECTED FIRMWARES
ABOUT
Available devices on Ethernet
192.168.254.254 (MX8x8DVI FRAME) (SN:DEMO )
Device Properties
Device Name: MX8x8DVI FRAME
Serial Number: SN:DEMO
IP address: 192.168.254.254
MAC address: 00-20-4A-B1-09-32
Communication
-> select_GPIO 0
-> select_GPIO 6
No card found
Quick Bootload (checksum verification only)
Controller Type | Hardware Version | Bootloader Version | Firmware Version | Browse New Firmware
MX-DVI-CPU | HW:1.1 | FW:1.1.1 | FW:2.1.0
MX-DVI-EDID | HW:1.1 | FW:1.0.2 | FW:2.1.1
MX-CP1 | HW:2.0 | FW:1.0.2 | FW:1.0.4
Web Server | FW:1.10.0
Web Content | FW:1.1.7

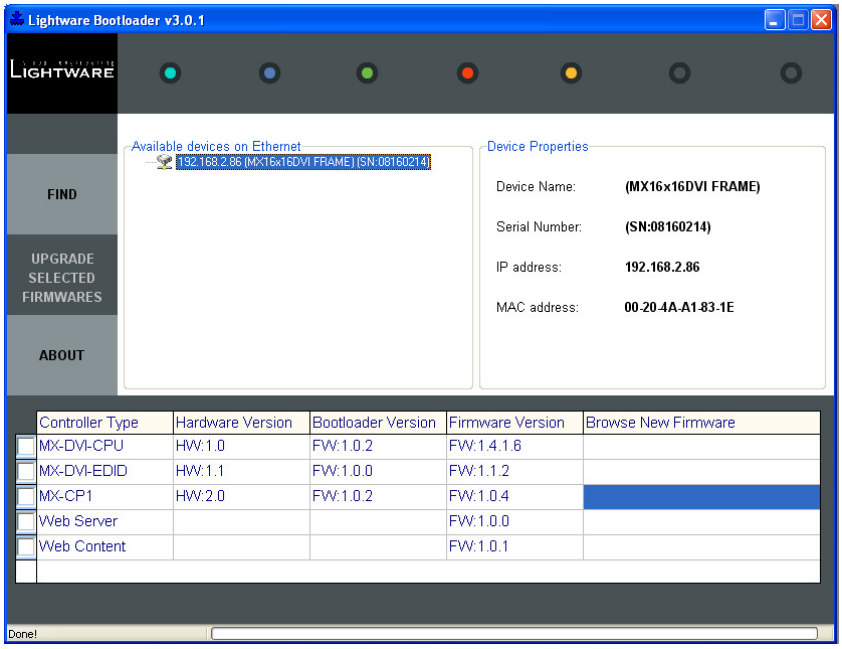
Click "UPGRADE SELECTED FIRMWARES" button. The router is being reprogrammed with the selected firmware after clicking on "YES" button. If you select a file that does not fit for the selected controller, you will get an information message about which file is wrong. If you selected a controller to upgrade, but you had not selected a file for it, then you will also get an information message about which file is missing.

**Quick Bootload** mode can be switched on or off any time. It makes the bootloader software faster by only checking the checksum of the controller. No data verification is done after writing if the checksum was correct.

*Info:* *The reprogramming time will vary between 3-8 mins per controller.*



When the firmware upgrade is done, you will get the following window:


Lightware Bootloader v3.0.1
LIGHTWARE
FIND
UPGRADE SELECTED FIRMWARES
ABOUT
Available devices on Ethernet
192.168.2.86 [MX16x16DVI FRAME] [SN:08160214]
Device Properties
Device Name: (MX16x16DVI FRAME)
Serial Number: (SN:08160214)
IP address: 192.168.2.86
MAC address: 00-20-4A-A1-83-1E
Controller Type | Hardware Version | Bootloader Version | Firmware Version | Browse New Firmware
MX-DVI-CPU | HW:1.0 | FW:1.0.2 | FW:1.4.1.6
MX-DVI-EDID | HW:1.1 | FW:1.0.0 | FW:1.1.2
MX-CP1 | HW:2.0 | FW:1.0.2 | FW:1.0.4
Web Server | FW:1.0.0
Web Content | FW:1.0.1
Done!

When all upgrades are done, you can close the connection with the last device, by closing the application, or you can select another matrix router to upgrade. After closing the bootloader application, switch the upgraded devices off and then on. Now the router is ready to be used with the new firmware.

*Info:* *After closing the bootloader application the router will reset!*

# 9. Troubleshooting

## 9.1. Serial connection problems

**Check the cable and software settings**

Check whether your null-modem cable is properly connected. In most cases there are more COM ports present in the operating system. Please verify the connection settings of your software. The router communicates with **9600** Baud, **8** data bit, **N**o parity, **1** stop bit.

**Check the protocol**

Check whether the proper protocol is selected (see Page 38). Select Protocol #1 in order to use the matrix with the controller software.

**Check the router**

Check whether the router is properly powered and whether CPU LIVE LED is blinking. Try performing a reset and verify that the default screen is on the LCD (see Page 34). Check the router health status from the front panel.

## 9.2. TCP/IP connection problems

**Check the IP settings and the cable**

Check the IP address on the front panel of the matrix. If IP collision happens, a notification message will appear. Try setting up the IP address and the subnet mask manually if it is necessary. Check whether your computer's firewall blocks the selected port. Check the cable: if you connect it directly into your computer, it has to be a cross-link cable.

**Check alive connections**

Only one connection is allowed simultaneously. Check whether there is another open collection (e.g. opened router web, running control software over ethernet). Try restarting the router if you have no other option.

## 9.3. There is no picture

**Check the cables**

Due to the high data rates, the cables must fit very well. DVI connectors have to be locked with screws, no tensions or breaches are allowed. If your source or display has more connectors then make sure that the proper interface is selected.

**Check the crosspoint matrix**

Check the connection between the input and output port either on the front panel or from web or the control software. Check whether the output is muted or not.

**Check the incoming signal**

Run the control software or the web and select the HDMI input settings. Check whether video signal is present on the input or not. If there is no video signal, then please continue at chapter 9.4.

**Check the outgoing signal**

Select the HDMI output settings in the control software or the web page. Check whether the video signal is present at the output or not. Try reloading factory default settings to the output. If the HotPlug or the display data is not present, make sure that your display device is configured properly.

**Check EDID related problems**

Maybe your display device is not capable of receiving the sent video format. Try emulating your display device's EDID to the source. You will find help to this process on Page 36, Page 72 or Page 85. If you get a picture now, you have an EDID related issue, please read the Advanced EDID Management chapter on page 90 for more details.

**Check router health**

Check the router health status and verify that DC voltages are present and fans are working. (see Page 35, Page 74 or Page 86).

## 9.4. There is no input signal

**Check the source**

Check whether your source is powered on and configured properly. The HDMI output can be turned off on most DVD players. If the source is a computer, then verify that the DVI output is selected and active. Try restarting your computer; if you get a picture during the booting process, you have to review the driver settings.

**Check the cable equalization**

Start the controller software or the webpage and verify at the input settings that the cable equalization is set properly. The automatic cable equalization is the best option in most cases, but you have to set it manually if you are working with very long cables.

**Check the EDID**

Maybe the data rate is too high for that type of cable. Try switching another EDID to the inputs with lower resolution. If the source is a computer and you are an expert user, you can try modifying the refresh rate in the preferred timing descriptor by lowering the clock frequency, so you would be able to get it to work at higher resolutions over a noisy connection.

If your source is an HDMI device, it is a good idea to disable the deep color support in the EDID. This way the data rate can be reduced by 30% at the expense of very small quality loss.

## 9.5. There is no sound

*Note:* *High-Bit-Rate audio formats such as Dolby True-HD or DTS-HD Master Audio cannot be sent over the S/PDIF cable.*

**Check incoming audio**

Start the controller software or the webpage and verify the incoming audio at the input settings. If there is no audio on the input, you should try changing the emulated EDID or review the settings of your source.

**Check the outgoing format**

Start the controller software or the webpage and verify the mode at the output settings. If the port operates in DVI mode, you can try forcing HDMI operation.

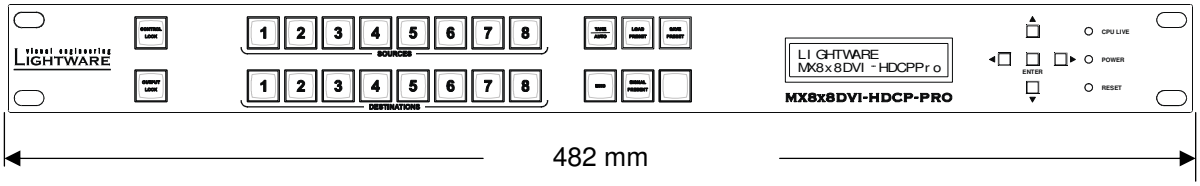
*Note:* *The S/PDIF outputs work both in HDMI and in DVI modes.*

**Check the EDID**

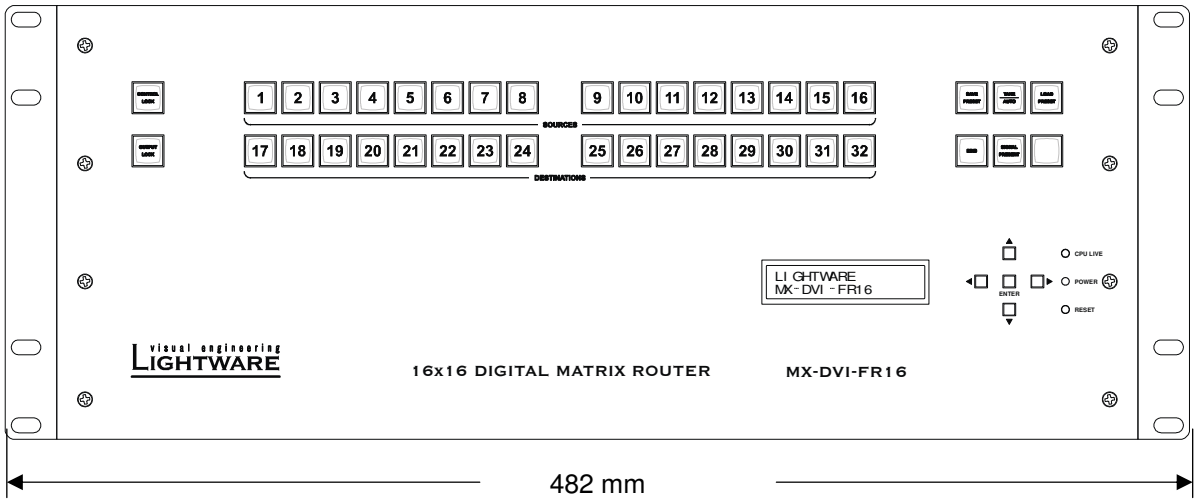
It is possible that your device doesn't support the sent audio format. Try emulating your display device's EDID to the source. You will find help to this process on Page 36, Page 72 or Page 85. If you get a picture now, you have an EDID related issue, please read the Advanced EDID Management chapter on Page 90.

# 10. Mechanical Drawings

## 10.1. Front view

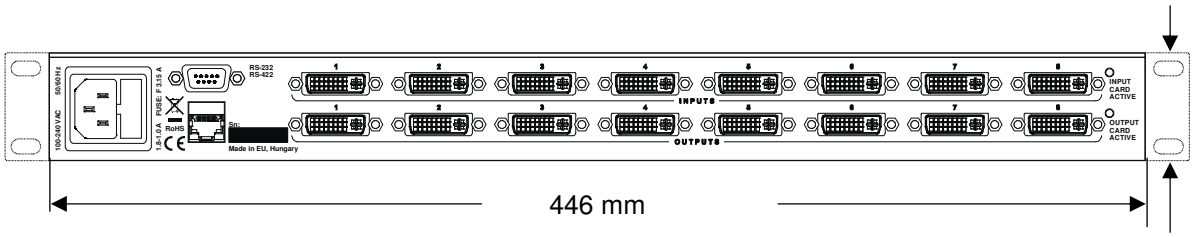



**MX8X8 series**




**MX-DVI-FR16**

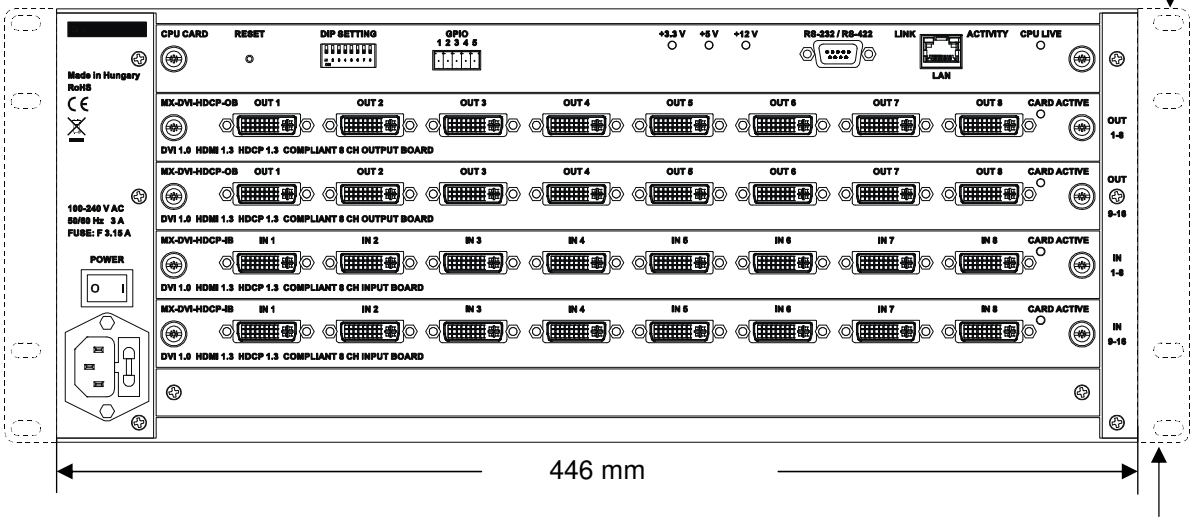
## 10.2. Rear view




446 mm

**MX8X8DVI-HDCP-PRO**

43.9 mm

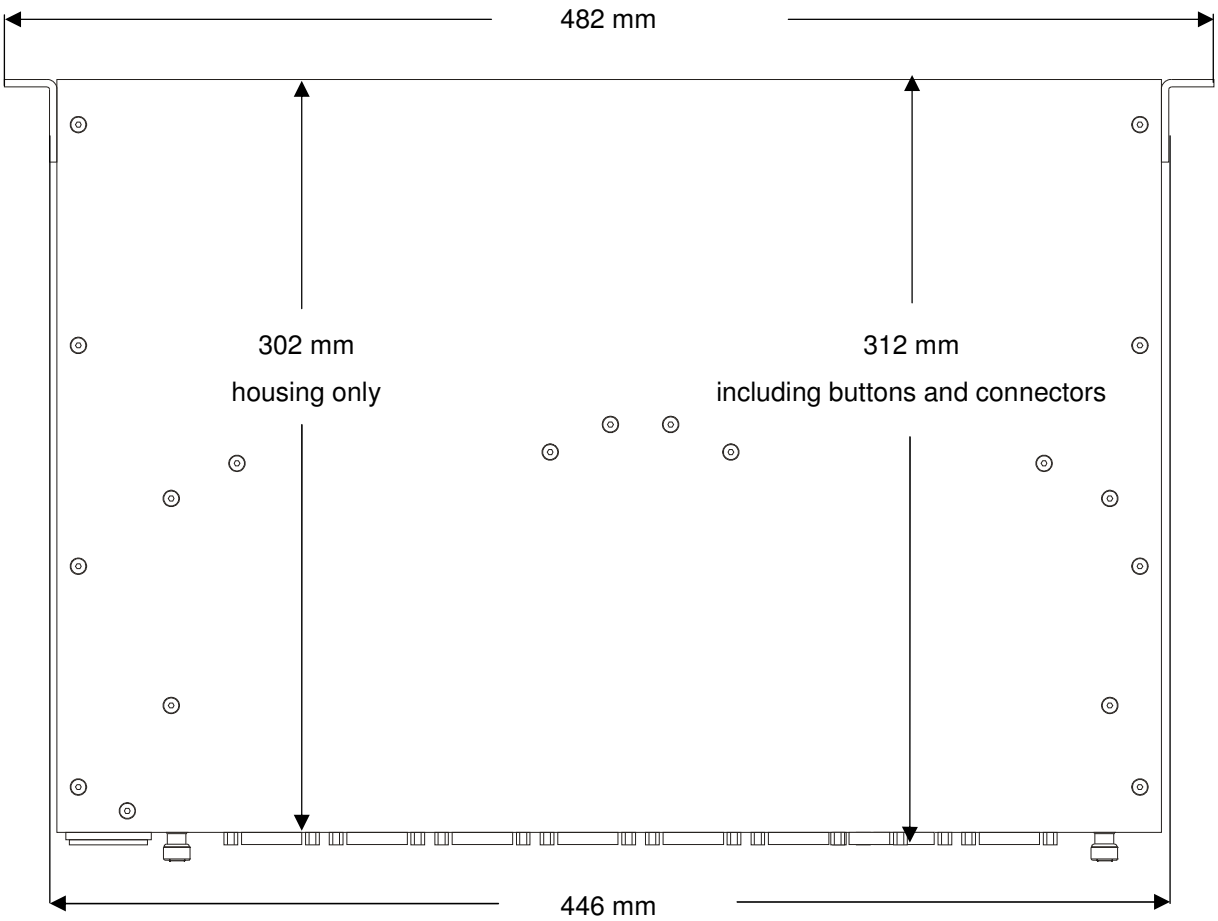



446 mm

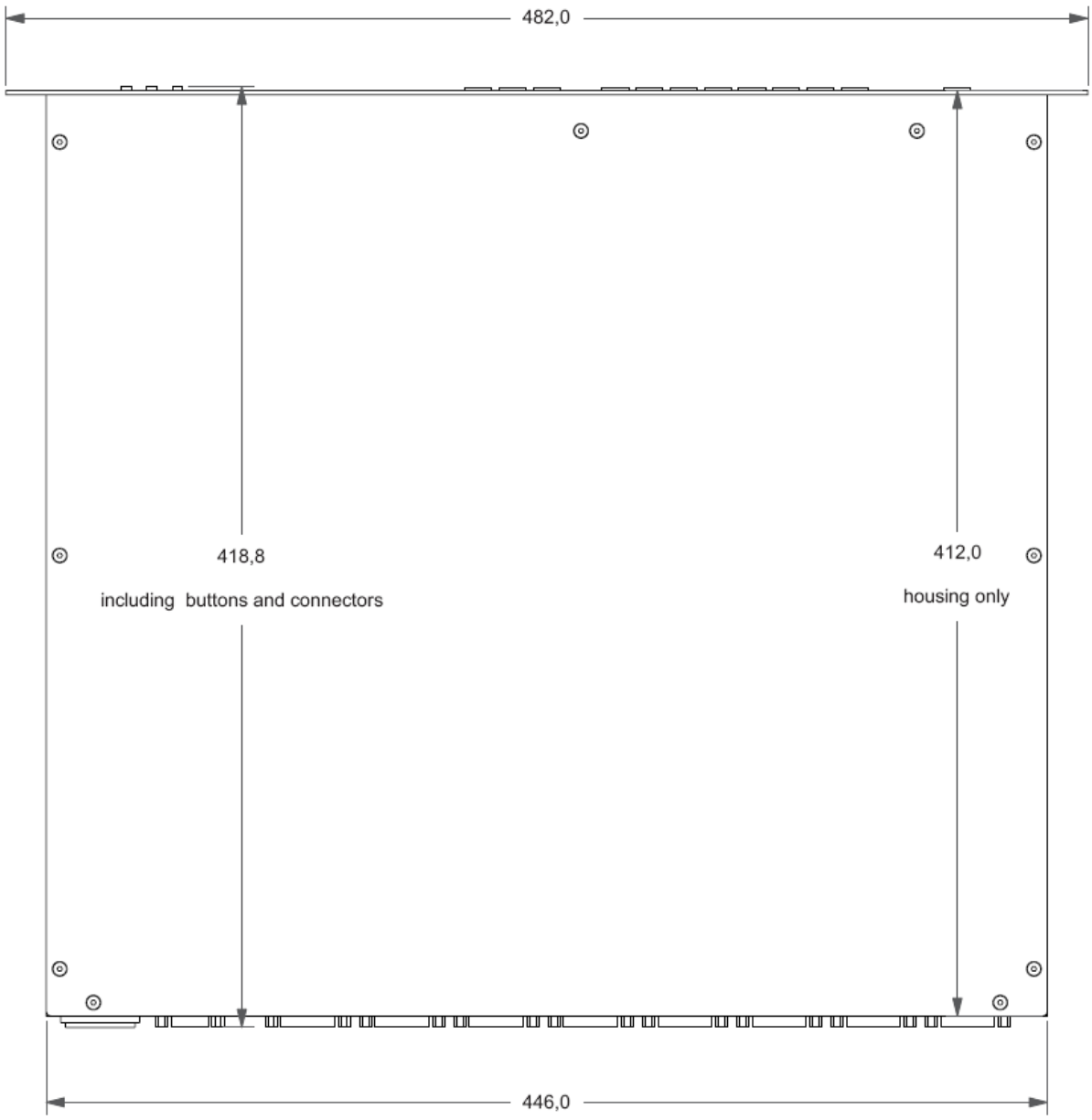
**MX-DVI-FR16**

176.5 mm

## 10.3. Top view

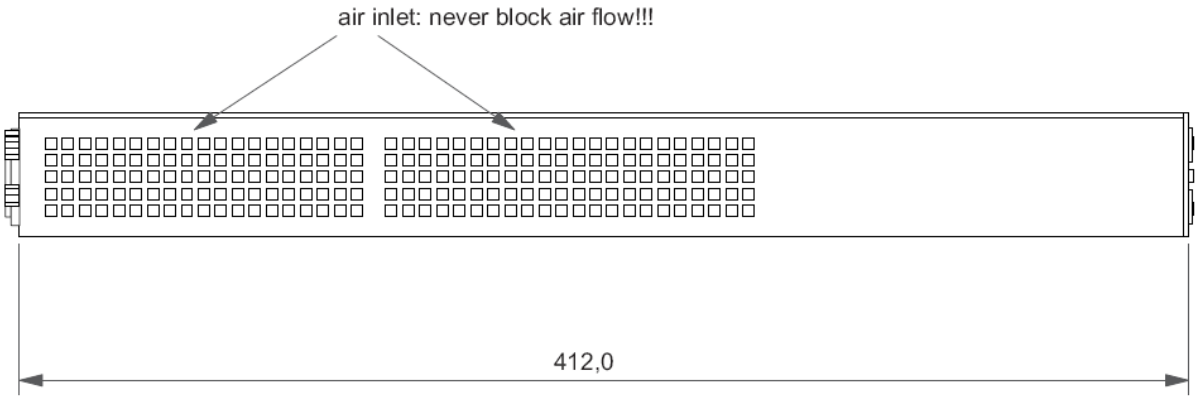



**Top view of MX-DVI-FR16**

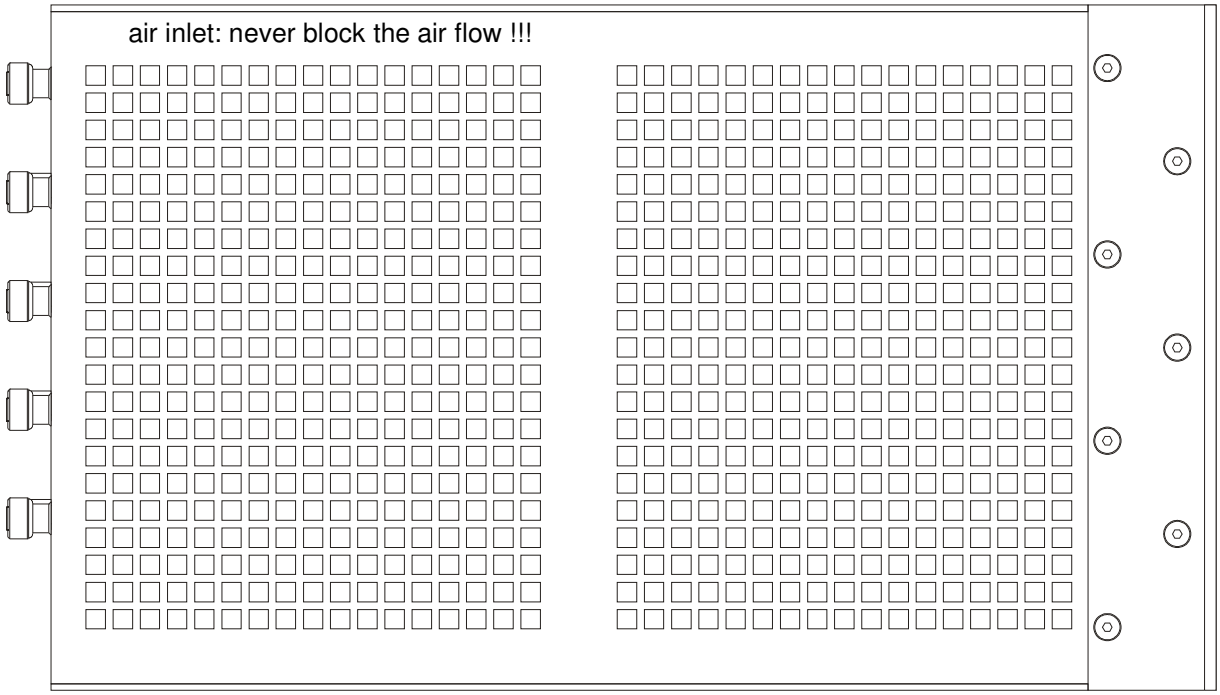



**Top view of MX8X8DVI-HDCP-PRO**

## 10.4. Left view

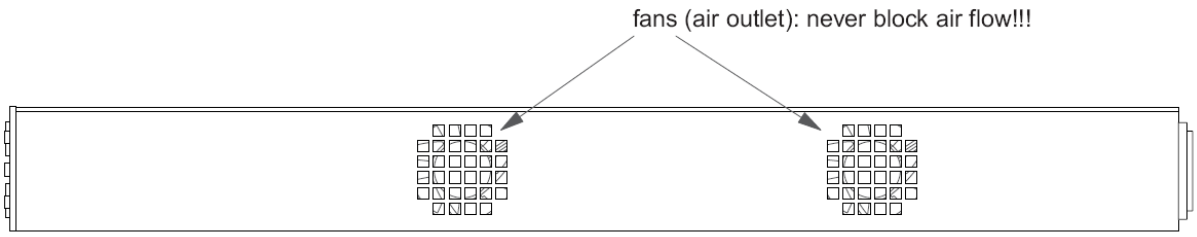



**Left view of MX8X8DVI-HDCP-PRO**

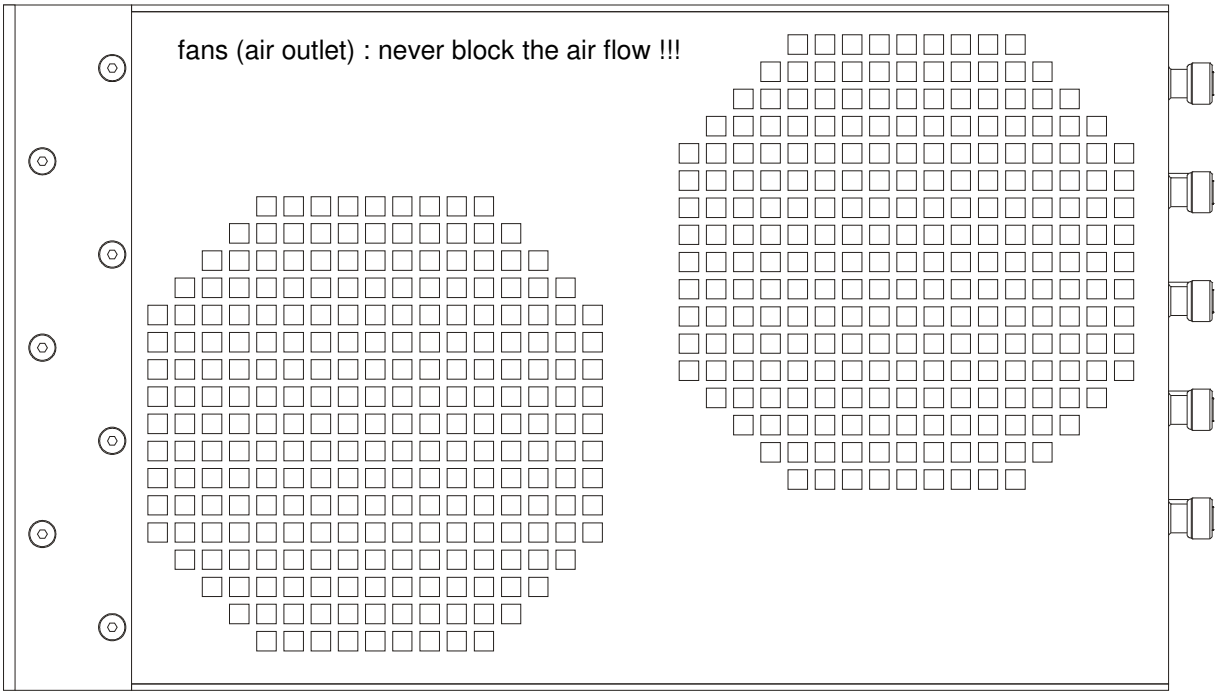



**Left view of MX-DVI-FR16**

## 10.5. Right view




**Right view of MX8X8DVI-HDCP-PRO**




**Right view of MX-DVI-FR16**

# 11. Warranty

Lightware Visual Engineering warrants this product against defects in materials and workmanship for a period of three years from the date of purchase.

The customer shall pay shipping charges when unit is returned for repair. Lightware will cover shipping charges for return shipments to customers.

In case of defect please call your local representative, or Lightware at

Lightware Visual Engineering
1071. Budapest Peterdy str. 15, HUNGARY

Tel.: +36 1 889 6177
Fax.: +36 1 342 9903
E-mail: support@lightware.hu

# 12. Quality Check Record

| Model name | Serial number | Date of manufacture | Checked |
|---|---|---|---|
| | | | |

## 12.1. Hardware

| Card | HW | FW |
|---|---|---|
| PSU | | |
| IN1 | | |
| IN2 | | |
| IN3 | | |
| IN4 | | |
| OUT1 | | |
| OUT2 | | |
| OUT3 | | |
| OUT4 | | |
| | | |

| Card | HW | FW |
|---|---|---|
| CPU | | |
| EDID MGMT | | |
| Control P #1 | | |
| Control P #2 | | |
| Web Server | | |
| Web Content | | |
| Mother BRD | | |
| SUBNET | | |
| MAC ADDR | | |
| IP ADDR | | |

## 12.2. Electrical check

| | | | |
|---|---|---|---|
| GND/EARTH Safety | ☐ | Inputs | ☐ |
| +3.3V; +5V; +12V | ☐ | Input LED's | ☐ |
| CPU Live | ☐ | Outputs | ☐ |
| Fan1 & Fan2 | ☐ | RS-232 | ☐ |
| Buttons | ☐ | LAN | ☐ |

NOTES: